TELEPHONE ENGINEER

THE INTERNATIONAL TECHNICAL JOURNAL

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1934

TELEPHONE POLE MARKING PLAN
R. C. Reno

BASIC TELEPHONE ELECTRIC THEORY
Part II
B. C. Burden

UNIQUE EXCHANGE BUILDING
A. O. Black

To Our Friends

At this season of the year, our thoughts naturally turn to the friendships we have made through both our business associations and our social contacts.

We appreciate and value the cordial relationship that has existed between the telephone operating and manfacturing organizations and Telephone Engineer and wish to do all we can to preserve and strengthen it. Their continued patronage has made it possible to make vast improvements in this publication, through which it is better able to serve the telephone industry.

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ENTERED AS SECOND-CLASS MATTER, AT THE POST OFFICE AT MORTON, ILLINOIS, UNDER THE ACT OF MARCH 3, 1879.

A Noble Ideal

Walter Gifford, president, American Telephone and Telegraph Company, in outlining the policy of the Bell System in 1927, gave the American public the spirit which guides the entire telephone operating industry.

Mr. Gifford was addressing a convention of the National Association of Railroad and Utilities Commissioners and after outlining the responsibilities of the Bell System to the public it serves and to those who have invested their savings in its securities, he said:

"Our policy and purpose are the same as yours—the most telephone service and the best at the least cost to the public . . . With your sympathetic understanding we shall continue to go forward, providing a telephone service for the nation more and more free from imperfections, errors or delays, and always at a cost as low as is consistent with financial safety."

Merry Christma

EDITORIAL

LOOKING IN?

LOOK OUT!

A Chinese philosopher determined to keep his son free from the world's contamination. He built a high wall around his property so that the boy could neither climb nor see over it. Within these confines the youth occupied himself with the care of an olive grove.

One day mischievous lads, curious to see and tease the imprisoned youth, brought ladders and climbed to the top of the wall. Then they lowered a huge green melon on a string, telling the isolated boy to compare his puny olive with the sort that were raised outside.

That night, the lad hanged himself from the branch of an olive tree, heartbroken at his apparent failure.

Conditions and customs are continually building up Chinese walls around each of us. And to keep our perspectives, we must be continually tearing them down. This is particularly true in the case of industrial executives.

Take, for example, the matter of equipment obsolescence. How can one detect it? Not by looking IN, but by looking OUT.

One can tell little about obsolescence by merely inspecting his own machinery. Age does not tell the story. Under certain conditions, a 15-year-old machine may serve your purpose as well as a new one. But under other conditions, a three-year-old machine may be entirely out of date.

Obsolescence can only be determined by comparing the machinery that you have with the machinery that you MIGHT have. And the proper basis for such a comparison means that one must tear down the mental wall of tradition that custom builds up without one's realizing it.

Today, more than ever, industry needs the utmost that improved machinery has to offer. Competition demands cost reduction.

Make smooth the paths that will bring you reliable information about such industrial equipment as you might have but have not. Welcome the representatives and the literature that bring tidings of improved equipment. For knowledge is power in the matter of replacement decisions.

And intelligent replacement is the key to tomorrow's profits!

—IRON AGE.

By
John H. Van Deventer
Industrial Consultant
The Iron Age

As We See It . . . .

Urges SPENDING Depreciation Reserves

Sound advice was sounded by W. C. Henry, general manager, Northern Ohio Telephone Co., Bellevue, Ohio, and president of the Ohio Independent Telephone Association in his semi-annual report to the Association when he recommended the SPENDING of telephone depreciation reserves for rebuilding of plants.

In his report Mr. Henry states:

"Prices of telephone equipment and construction material have already risen materially during the past few months, some items more than twenty-five per cent. It is a safe prediction that there will be either a gradual improvement in business during the next several months or there will be further inflation. In either case, the price of telephone supplies is bound to rise still higher. I strongly recommend that all telephone companies stock their warehouses with necessary items of construction material and place orders for equipment without further delay, if they would avoid a further increased price on these items.

"Recent decisions of the Federal Supreme Court have made clear the fact that telephone companies are not going to be allowed to set aside out of annual earnings large sums for depreciation and then fail to expend the depreciation fund for the rebuilding of their plants. You must either spend a reasonable portion of your annual depreciation or you will soon be forced to cut down the amount charged against income for this account. Failure to spend the amount set aside for depreciation will gradually lower the physical condition of your property, increase your income taxes, and in the end jeopardize your rate structure.

"New regulations of the Treasury Department are aimed at excessive or unused depreciation charges and reserves, and henceforth, it is going to be necessary for you to justify the depreciation deduction on your Corporation Income Tax Return. I would recommend that all companies, and especially those with a large depreciation reserve, seriously consider this matter from all angles."

Financial Writers Rap A. T. & T. Inquiry

The financial world has shown more interest in the present investigation of the Bell Telephone System by the Federal Communications Commission than any other investigation of that organization.

With the announcement of the inquiry on November 15 and its extensive publicity coming at the time when Wall Street was expressing doubt as to whether the A. T. & T. Co. would pay its regular quarterly dividend of $2.25 the A. T. & T. stock took a sharp dip.

The downward trend of the stock continued until Novemeber 17-when President Gifford made it known that his company has no objections to the investigation and that it had no skeletons in its closet. This statement coupled with the declaration of the regular dividend on November 21 alleviated the Street's fears and the stock gained back more than half of its loss.

Newspaper financial editors are watching closely developments in Washington and have had and are having plenty to say about the activity of the FCC.

Robert P. Vanderpool of the Chicago *American* says:

"World travelers, familiar with the telephone service offered in other countries, are watching with possibly more concern than the average citizen, attacks against the A. T. & T. Co. Critics of the A. T. & T. Co. may be right in some or many of their charges. We do not profess to know. We do know that the telephone service in America is so far superior to other parts of the world that there is just no comparison. We do know that utility service of many kinds has frequently been ruined in the United States by making political footballs of the utility companies. We should hate to see inferior telephone service result from either justified or unjustified attacks on the A. T. & T. Co. We know, too, that several hundred thousand Americans have invested in telephone stock and that for the most part they are not wealthy people, but men and women who worked hard and practiced thrift because they had been taught that thrift was a virtue. If these investments are wrecked and telephone service is demoralized the price that will have been paid for an 'investigation' of the A. T. & T. Co., may very well prove to have been quite excessive."

The Denver *Post* remarks:

"As one of the biggest and most successful corporations, the A. T. & T. is a natural target for the new deal sharpshooters. . . . Anything that is successful and prosperous must need investigating. And the aim of the probers into the A. T. & T. will not be to learn the secret of its success but to strip it of its financial strength if possible. The fact that it has more than 600,000 stockholders—more than any other concern—will be ignored. Some . . . have the idea there must be something wrong if anybody can be solvent during a depression."

The St. Louis *Star Times* declares:

"If the inquiry is fairly conducted only good can come of it. For one thing, it will be an investigation of a holding company at its best, from the standpoint of general honesty. . . . It has been run, with a scrupulousness almost unparalleled in American high finance, for the benefit of the hundreds of thousands of individuals who own stock in it."

Telephone POLE Marking PLAN

● Use of metal markers for pole and other equipment identification recommended to telephone, oil pipe line and railroad companies.

By
R. C. RENO
Editor

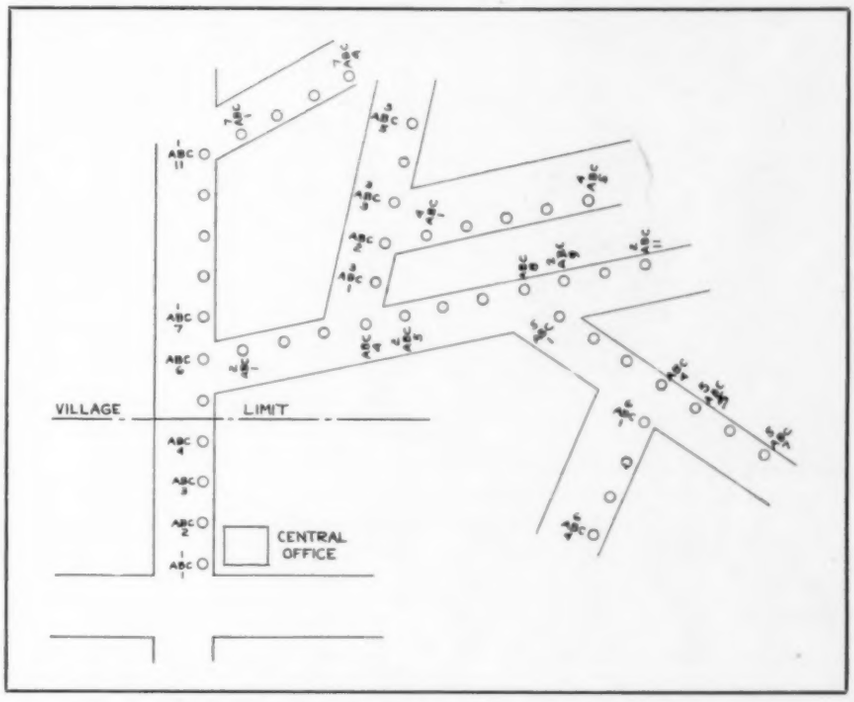


Fig. 1. Sketch showing plan for assigning line numbers and poles to be marked.

IN PRACTICALLY every industry, successful plants find it of advantage to follow some approved method of marking their properties by letters or numbers or both.

Public utilities have particular reason for marking their far-flung properties in order to facilitate the keeping of records and to enable construction or repair orders to be carried out with precision and dispatch. Many public service commissions now require that public utilities under their jurisdiction mark poles and conductors so that such properties can be readily distinguished

When property or equipment is to be so marked, it is important that the method used furnishes identification that is permanent; that is economically applied and requires no maintenance; that will be legible at the distance from which it will be read. Since much of a public utility's emergency work is done at night, the marking should be readable with the aid of a small amount of light and the identification must be unmistakable.

Until the last few years the marking of equipment was usually accomplished by painting with the aid of stencils, some identifying mark and a number but it was found that these painted markings were short lived and the painting practice has been pretty generally abandoned in favor of the use of metal markers fastened to pole and other equipment by means of small nails and special holding plates and brackets.

It has been found that aluminum markers are one of the best types to be used because this metal seems to remain clear and legible under all climate conditions and because of its long life characteristic.

The convenience of and the economy in applying metal markers have been taken into consideration by the many utilities using the aluminum characters. It has been found that the initial cost of marking with metal characters is no greater than that of stenciling and since these markers seldom need replacement, the cost of restenciling every year or two is eliminated. The ease with which metal markers are placed is one of the two main reasons for this adoption by a great many public utilities. They are attached directly to wood surfaces, or can be fastened onto steel towers or other hard surfaces by use of special holding devices.

Another advantage brought out in the use of metal markers is that they are essential for marking creosoted poles since it is impossible to paint or stencil wood that has been so treated.

Among industries using metal identification markers extensively are telephone and telegraph companies, railroads and oil pipe line companies.

Telephone and telegraph systems require the identification of many properties, both for the purpose of quickly and easily locating trouble and to aid in keeping of records and the compiling of statistical information.

Some of the more important uses for metal markers in telephone and telegraph systems are:

1. **Pole marking.**
2. **Indicating transpositions.**
3. **Property ownership designation.**
4. **Designating dispatch and message telephone circuits on communications, pole lines along railroads as a means of identification for users of portable telephones.**
5. **Marking cable terminals and terminal boxes.**

As telephone companies use metal markers more extensively for pole identification for ownership and location, discussion will be given here as to a suggested pole marking plan which has been used successfully by many telephone companies.

In this plan ownership identification may be accomplished by using initials of the company, viz.: "D. T. Co." for

Dixon Telephone Company with letters one-half inch high embossed on tags about seven-eighths inches wide. This size will accommodate about two letters per inch of length. Location identification involves the use of a plan by means of which the location of a particular pole may be determined within reasonable limits, from its number.

Each line of poles should be identified by a number, then the poles in each line should be numbered con-

secutively starting with No. 1. Under this plan the definite location of a particular pole is determined from the line number of which it is a part. It

is suggested that the assignment of pole line numbers should be about as follows:

1. **To a pole line going away from the central office assign No. 1.**

2. **To the first branch off this main line assign No. 2.**
3. **To the first branch off No. 2 assign No. 3, etc.**

The second branch line off the main line would take the next consecutive unassigned line number, branches off this line being assigned the next consecutive unassigned numbers, etc.

After line numbers have been assigned to all branches from line No. 1 it is suggested that another main line from the central office be taken, to which is assigned the next consecutive unassigned line number and the same process as given above be applied. Some modification of this plan might be desirable in cities and villages, such as assigning one line number to a street or use the name of the street for records and number all poles on one street consecutively from one end to another.

It is considered advisable to plot on a topographical or another map the route of all pole lines and indicate what poles will be tagged for ownership, line number and pole numbers. From this information the number of tags and numerals required can be obtained. The work of marking poles should not proceed until detailed plans have been laid out. A complete record of all this work should be kept in the office.

In this plan, it is suggested that poles be marked in accordance with the following outline:

Ownership identification and pole **numbers** should be on each pole within the incorporated limits of cities and villages. Outside incorporated limits markings should be placed as follows:

(*Please turn to page* 33)

TABLE

Showing Quantities of Individual Figures Required For Various Series of Numbering.

	Quantity of Individual Figures										
Nos.	1	2	3	4	5	6	7	8	9	0	Total
1 to 25	13	9	3	3	3	2	2	2	2	2	41
1 to 50	15	15	15	15	6	5	5	5	5	5	91
1 to 75	18	18	18	18	18	17	13	7	7	7	141
1 to 100	21	20	20	20	20	20	20	20	20	11	192
1 to 125	59	29	23	23	23	22	22	22	22	22	267
1 to 150	86	35	35	35	26	25	25	25	25	25	342
1 to 175	114	38	38	38	38	37	33	27	27	27	417
1 to 200	140	41	40	40	40	40	40	40	40	31	492
1 to 225	153	75	43	43	43	42	42	42	42	42	567
1 to 250	155	106	55	55	46	45	45	45	45	45	642
1 to 275	158	134	58	58	58	57	53	47	47	47	717
1 to 300	160	160	61	60	60	60	60	60	60	51	792
1 to 325	173	169	89	63	63	62	62	62	62	62	867
1 to 350	175	175	126	75	66	65	65	65	65	65	942
1 to 375	178	178	154	78	78	77	73	67	67	67	1017
1 to 400	180	180	180	81	80	80	80	80	80	71	1092
1 to 425	193	189	183	109	83	82	82	82	82	82	1167
1 to 450	195	195	195	146	86	85	85	85	85	85	1242
1 to 475	198	198	198	174	98	97	93	87	87	87	1317
1 to 500	200	200	200	200	101	100	100	100	100	91	1392
1 to 525	213	209	203	203	129	102	102	102	102	102	1467
1 to 550	215	215	215	215	157	105	105	105	105	105	1542
1 to 575	218	218	218	218	194	117	113	107	107	107	1617
1 to 600	220	220	220	220	220	121	120	120	120	111	1692
1 to 625	233	229	223	223	223	148	122	122	122	122	1767
1 to 650	235	235	235	235	226	176	125	125	125	125	1842
1 to 675	238	238	238	238	238	213	133	127	127	127	1917
1 to 700	240	240	240	240	240	240	141	140	140	131	1992
1 to 725	253	249	243	243	243	242	168	142	142	142	2067
1 to 750	255	255	255	255	246	245	196	145	145	145	2142
1 to 775	258	258	258	258	258	257	229	147	147	147	2217
1 to 800	260	260	260	260	260	260	260	161	160	151	2292
1 to 825	273	269	263	263	263	262	262	188	162	162	2367
1 to 850	275	275	275	275	266	265	265	216	165	165	2442
1 to 875	278	278	278	278	278	277	273	243	167	167	2517
1 to 900	280	280	280	280	280	280	280	280	181	171	2592
1 to 925	293	289	283	283	283	282	282	282	208	182	2667
1 to 950	295	295	295	295	286	285	285	285	236	185	2742
1 to 975	298	298	298	298	298	297	293	287	263	187	2817
1 to 1000	301	300	300	300	300	300	300	300	300	192	2893
1 to 2000	1600	601	600	600	600	600	600	600	600	492	6893
1 to 3000	1900	1900	901	900	900	900	900	900	900	792	10893
1 to 4000	2200	2200	2200	1201	1200	1200	1200	1200	1200	1092	14893
1 to 5000	2500	2500	2500	2500	1501	1500	1500	1500	1500	1392	18893
101 to 1000	280	280	280	280	280	280	280	280	280	181	2701
1001 to 2000	1299	301	300	300	300	300	300	300	300	300	4000
2001 to 3000	300	1299	301	300	300	300	300	300	300	300	4000
3001 to 4000	300	300	1299	301	300	300	300	300	300	300	4000
4001 to 5000	300	300	300	1299	301	300	300	300	300	300	4000

BASIC Telephone Electrical THEORY

● Part II of Mr. Burden's series of articles dealing with basic theory of electrical engineering as applied to the telephone field discusses alternating current principles.

By
B. C. BURDEN

Transmission Engineer
Lincoln Neb. Tel. & Tel. Co.

IT IS difficult if not impossible, to have a good working knowledge of the complex apparatus used in modern power and telephone systems, and especially in those phases of the communication art which have been built up around the vacuum tube without a thorough understanding of alternating current principles. This understanding will only come with a diligent study of alternating current theory making sure each point is thoroughly understood before taking up new work.

That the effort required to obtain a technical training in electrical engineering is not wasted is attested by the fact that each year technical schools and colleges over the country are annually turning out thousands of graduates who are entering industry and who will compete with untrained practical man. Past experience of large companies has demonstrated that the college man's chances are approximately ten times better than the practical man's chances when it comes to promotion. Up until the last few years the majority of the yearly crop of engineering graduates have been easily absorbed by industry in connection with the large amount of engineering work that has been necessary.

The saturation point has apparently been reached in this direction however, and graduating engineers are now turning to maintenance and operating fields for positions and will undoubtedly offer the practical non-technical man some real competition. So it would seem that now is the time for the non-technical man to do some real digging so as to be ready for competition when it arrives.

In considering the theory of alternating current apparatus and circuits we must acquaint ourselves with several new terms and definitions and that we must revise somewhat our conception of Ohm's Law as understood and used in connection with direct current circuits and equipment.

Alternating current theory is somewhat more complex than is direct current theory, however if basic principles governing alternating currents are thoroughly learned and if the student is familiar with elementary algebra and simple trigonometry, no difficulty in handling problems that ordinarily arise in practical work should be encountered.

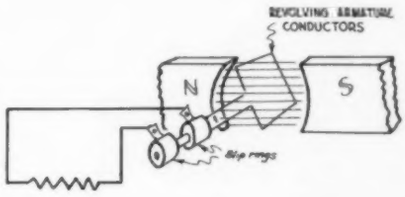


Fig. 2. Elementary alternator equipped with slip rings.

When electricity flows from negative to positive, or from positive to negative continuously and does not reverse its direction of flow, it is referred to as direct current. It may vary in magnitude, it may start and stop in pulsating manner, but as long as it always flows in the same direction it is direct current.

Alternating current, on the other hand, is a current that varies its direction of flow in a definite and periodic manner.

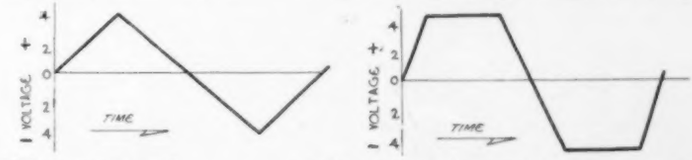
The terms "direct current" and "alternating current" as commonly used refer to both voltages and currents, that is, refer to voltages which do not vary in direction as "DC voltage," and voltage that does reverse its direction in a periodic manner, as "AC voltage."

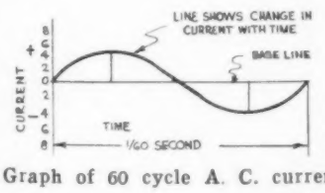
In connection with studies of alternating current theory use is made of "graphs" in pictorially presenting facts regarding alternating current phenomena. A graph is merly a diagram or curve representing successive values of a changing quantity, as used in connection with electrical theory a graph shows not only change in magnitude but change in polarity. Fig. 1 gives a graph for a steady DC current and one for a 60 cycle alternating current.

All generators inherently generate alternating current, and it is therefore necessary to provide generators with commutators in order to convert inherently generated alternating current into direct current. Now in order to utilize inherently generated alternating current it is only necessary to provide the generator with slip rings connected to opposite ends of the revolving loop (in the simplest type) as shown in Fig. 2.

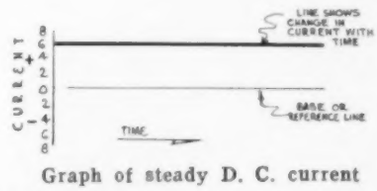
In case the generator is the type having a revolving magnetic field and stationary conductors, then the generated alternating current may be drawn directly from the conductors without necessity of slip rings. Slip rings would, of course, be required to conduct direct current into revolving field coils. In most commercial alternating current generators it is customary to use the type having a revolving field and stationary conductors as power required for exciting the field is much less than that drawn from the generator, hence, can be more readily handled by slip rings and brush arrangement.

Fig. 3 Odd types of A. C. waves





Graph of 60 cycle A. C. current



Graph of steady D. C. current

Fig. 1. Use of Graphs

In generation of direct current it is usually desirable that the output wave be as constant in value as possible, that is, that the voltage does not vary in magnitude. But in generation of alternating current it is, of course, obvious that the voltage will have to vary from zero to maximum magnitude and back to zero in a positive direction, and then vary from zero to maximum and back to zero in a negative direction. This complete variation being known as a *cycle.*

It is also obvious that there are a large number of ways in which this variation in voltage and current in an AC generator could take place. For example, it is conceivable that current might start from zero and increase at a definite uniform rate until maximum value is reached and then decrease at the same rate. This type of wave is shown in Fig. 3.

Note the term *wave* refers to the graphic picture of the change in magnitude and polarity of voltage or current of an AC source over a definite time. The time interval is that required to complete a cycle.

The rate at which voltage or current of an AC source varies in passing from zero to maximum and back to zero is quite important. It is *highly desirable for most applications that the rate of change follow* what is known as a *sine wave* variation.

A sine wave is one in which instantaneous voltage or current at any point in a cycle is proportional to the sine of the angle at that point in the cycle. Fig. 4 illustrates how a sine wave might be developed by a single coil generator with the coil revolving through 360°. Commercial generators are so designed that the output is substantially a sine wave.

Referring to Fig. 4 it will be seen that the revolving coil if started from a point midway between two field poles will cut magnetic lines of force at a gradually increasing rate until it reaches a point exactly 90° from its starting point, at which point it is cutting lines of force at a maximum rate. From this point it will cut lines of force at a decreasing rate until it reacehes a point 180° from the starting point.

At the 180° point the revolving coil is again cutting zero lines of force; hence, generated voltage will be zero. The coil as it continues to revolve begins cutting lines of force at an increasing rate until it reaches a point 270° from the starting point at which time it is cutting through the magnetic field at a maximum rate hence voltage generated is a maximum. The coil in passing from the 270° point back to the starting point will cut lines at a decreasing rate until the starting point is reached at which point generated voltage will again be zero, and the coil will have revolved through 360° thus completing one cycle. It should be noted that the polarity of induced voltage is reversed after the coil passes the 180° point in its revolution.

It should be particularly noted that voltage at any point *is determined by the sine of the angle which the conductors make at that instant with the starting point.* For example, if maximum voltage generated was 100 volts, then at the instant conductors are passing through an angle 30° from the starting point voltage generated would be 100 × sine of 30° or 100 × 0.5 = 50.0 volts.

For benefit of those that may have forgotten their trigonometry it might be stated that the sine of an angle (in any right angle) is the ratio of the side opposite the angle over the hypotenuse. Fig. 5 illustrates this simple trigonometric relation. An inspection of this illustration will readily show how voltage varies in proportion to the sine of the angle. It will be noted the sine of an angle of 90° would be 1.0.

It is evident from an inspection of a sine wave that some average value must be used in referring to voltage or current in an alternating current circuit inasmuch as magnitude of the voltage or current is continually varying from zero to some maximum value and is flowing first in one direction and then in the other.

The average value of a sine wave can be obtained by taking the average of all the separate vine values. If this is done the average value of an alternating current wave is 0.636 times the maximum value. For example, if the maximum value of an AC voltage wave was 100 volts, the average value would be 63.6 volts.

At first thought, it would seem this would be the value that would be used in all alternating current computations.

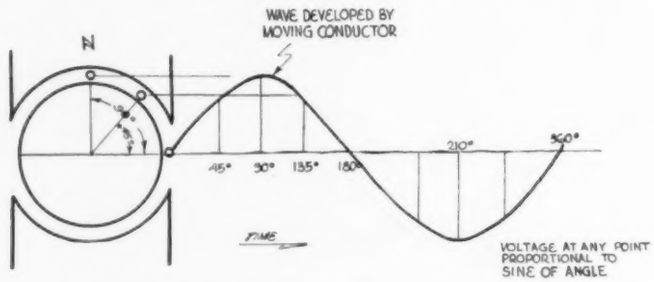


Fig. 4 Development of a sine wave.

Fig. 5. Trigonometric relation in right angle triangle.

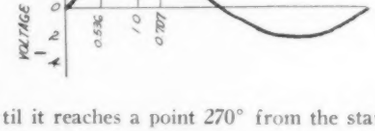
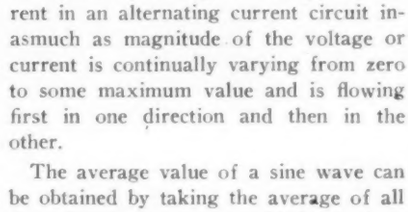


Fig. 6. Relation between average effective and maximum voltage.



It has been found, however, that energy represented by an AC sine wave is not proportional to 0.636 times the maximum value but rather to 0.707 times the maxi-

(*Please turn to page* 34)

Convention Schedule

Minnesota Telephone Association, Hotel Lowry, St. Paul, January 29, 30, 31.

Nebraska Telephone Association, Hotel Lincoln, February 13, 14.

Ohio Independent Telephone Association, Hotel Deshler-Wallick, Columbus, May 1, 2.

UNIQUE exchange BUILDING

● This steel building is highly fire-resisting and the telephone company succeeded in getting an extremely low insurance rate.

By

A. O. BLACK

General Manager
People's Telephone Corp.

Butler, Pa.

Cellograph Halftone by Schoenwald Corp.

Insulated Steel Building at North Washington, Pa. L. L. Ruggels and A. W. McRae Automatic Electric Co.

THE IDEA of operating unattended dial exchange equipment has been said to have originated with Roy Owens. Owens operated unattended sub-offices in Columbus, O., in the early 1900's. Some of these installations were made in underground brick and concrete vaults and dial telephone service was given for some time from these installations.

General development of the unattended dial exchange in small communities can be said to date from the period just after the World War.

One of the advantages claimed for this type of equipment was its adaptability to almost any type of housing. Many installations have been made in rented quarters, rooms of private homes, in hallways of office buildings and lodge rooms, and in similar locations. These installations have given years of good telephone service.

Later isolated buildings were constructed of frame, concrete block and frame construction, and brick and frame construction. Many satisfactory installations are operating in such buildings.

Due to several unhappy experiences, there later arose a demand for a fire-resisting building. Such a building was built in 1933 by The People's Telephone Corp., Butler, Pa. A step by step unattended dial installation was made at this location, and put into service on November 1, 1933.

This building consists of a nine-inch solid brick wall resting on a concrete footer. The floor was a five-inch concrete slab made in two sections. The bottom section of three inches of concrete was covered with a waterproof asphalt membrane, and this membrane was covered with a two-inch layer of finished concrete. This floor was later covered with a 3/16 inch battleship linoleum. A roof slab of concrete was carried on the wall by means of steel joists. The roof slab was covered with a 20-year composition roof. The building contains no windows.

This building is highly fire-resisting, and the telephone company succeeded in getting an extremely low insurance rate. It was then discovered that the housing of unattended dial equipment in anything but fire-resisting construction was uneconomical. Saving in insurance premiums will amortize the additional cost of fire resisting construction in from six to 15 years. When comparison is made with rented quarters, the annual charges will construct the required fire-resisting buildings in from four and one-half to six years. **Conditions in other localities will produce other figures, of course, but without doubt fire-resisting construction should be considered before a decision is made to use rented quarters or to construct a non-fireproof building.**

Early in 1934, Peoples Telephone engineers became interested in modern steel construction, and after much investigation succeeded in having Insulated Steel Construction Co. of Middletown, O., design a frameless steel building which was thought to be particularly suited to use in housing unattended dial equipment. Such a building has been constructed at North Washington, Pa.

This building was designed to contain an ultimate of 200 lines of equipment. Estimates were made of buildings of various sizes, and finally it was decided that a building having an inside width of 10 feet, an inside length of 16 feet, and an inside ceiling height of 10 feet could be used to the greatest advantage. Construction of a smaller building would reduce the first cost very little. A larger building would seldom be required for this class of service. Dimensions allow plenty of aisle space and no crowding is necessary. Equipment for less than 60 lines is being installed in this building.

The building is placed on a waterproofed concrete footer and floor slab which is identical in construction to the Prospect building foundation. Frameless steel wall sections were nailed to the foundation with special concrete nails after a bed of mastic had been prepared on the foundation to receive the wall sections.

Frameless steel wall sections are made of a single thickness of twenty gauge Armco steel formed in corrugations which are two inches deep and

eight inches in length. These sections are covered with an asphalt compound for protection against rusting.

This wall was manufactured in the American Rolling Mills Co.'s sheet mill in Butler, and was fabricated in six sections in the mill. Each side wall was in two sections and the rear and the front of the building were each in a separately fabricated section.

These sections were securely fastened to each other with self-tapping sheet metal screws.

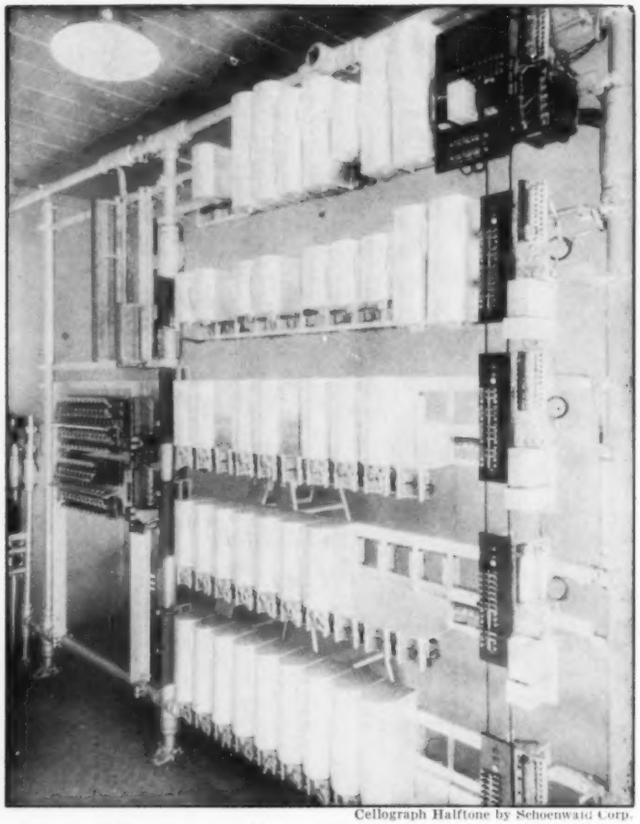
Roof and ceiling sections were made of 20-gauge Armco steel and are so constructed as to form a continuous flat surface above and below. Distance between these top and bottom surfaces is five and one-half inches. This steel box is divided by steel partitions on eight-inch centers. In reality the roof and ceiling section is constructed of adjacent steel boxes having a length equal to the width of the building, a height of 5½ inches, and a width of eight inches. The boxes are open, of course, for their entire length.

The roof and ceiling are fabricated in the mill in two sections. The wall and the roof were delivered to the job from the mill by truck, only one truck load being necessary for both wall and roof sections. The roof and ceiling sections were placed inside the wall sections after the wall sections had been erected. The roof and ceiling sections rested upon a steel moulding one inch deep and three inches high. This steel moulding had been securely fastened to the wall section with sheet metal screws. Additional screws held the roof and ceiling section in place and to each other.

After the wall section and the ceiling and roof section had been erected the entire outside surface was covered with one inch of insulation board. This insulation was fastened to the wall and roof with hardened screw nails. Just prior to placing the installation, the outside wall corrugations were broken up into eight-inch sections by wedging insulation board across the width of the corrugations.

When the insulation had been erected the aluminum wall bead which is designed to hold the outside enameled steel sheet, was placed, starting just above the ground line. This wall bead encircles the building in horizontal rows. The rows are placed the proper distance apart to receive the enameled steel wall sheets and corner details.

Over the insulation on the roof was placed a 20-year composition roof. A sectional copper cornice was then placed over the top of the wall, covering the upper edge of the enameled steel and the upper edge of the roof flashing. The roof drains through a four inch copper down spout at the center of the rear of the building. The inside of the wall was covered with 16-gauge automobile sheet fastened in place with self-tapping sheet metal screws. The inside wall and ceiling were finished in aluminum. Both natural gas and electric meter were placed on the outside rear wall of the building.



Cellograph Halftone by Schoenwald Corp.

Conduit Type Frames in Insulated Steel Building

This building is wired with flexible metal conduit which was placed in the wall corrugations, through the ceiling moulding and through the horizontal openings in the steel roof. This wiring was placed before either the insulation or the inside steel sheets were erected.

In addition to being highly fire-resistant, this building is considered to be superior in that it is more free from dust than a brick building. The walls and roof of the building have a coefficient of conductivity of heat of .19, equivalent to an 18-inch brick wall. The building is grounded and constitutes an electrostatic shield aiding in the elimination of radio interference.

After considering the advantages of the steel building it was decided that a metal casing was not required for telephone equipment installed in such a building. Telephone company engineers then designed a frame of hollow tubing to carry the central office equipment. Most of the wiring is done through the tubing.

Commercial power is carried from the steel wall through a conduit to the framework which supports the rectifier and through this framework to the rectifier. Wires are carried through the battery rack framework from the rectifier to the battery. Wires run through the battery rack frame and through the shelf frame carry the battery wires to the power shelf.

The entrance cable is carried from the outside of the building through a tubing to the cable terminal blocks which are located at the rear of the protectors and just above the lineswitches. This tubing is part of the shelf frame.

Protectors are wired by short cables to lineswitches which are directly below, and from the lineswitches cabling is then carried to the connector banks.

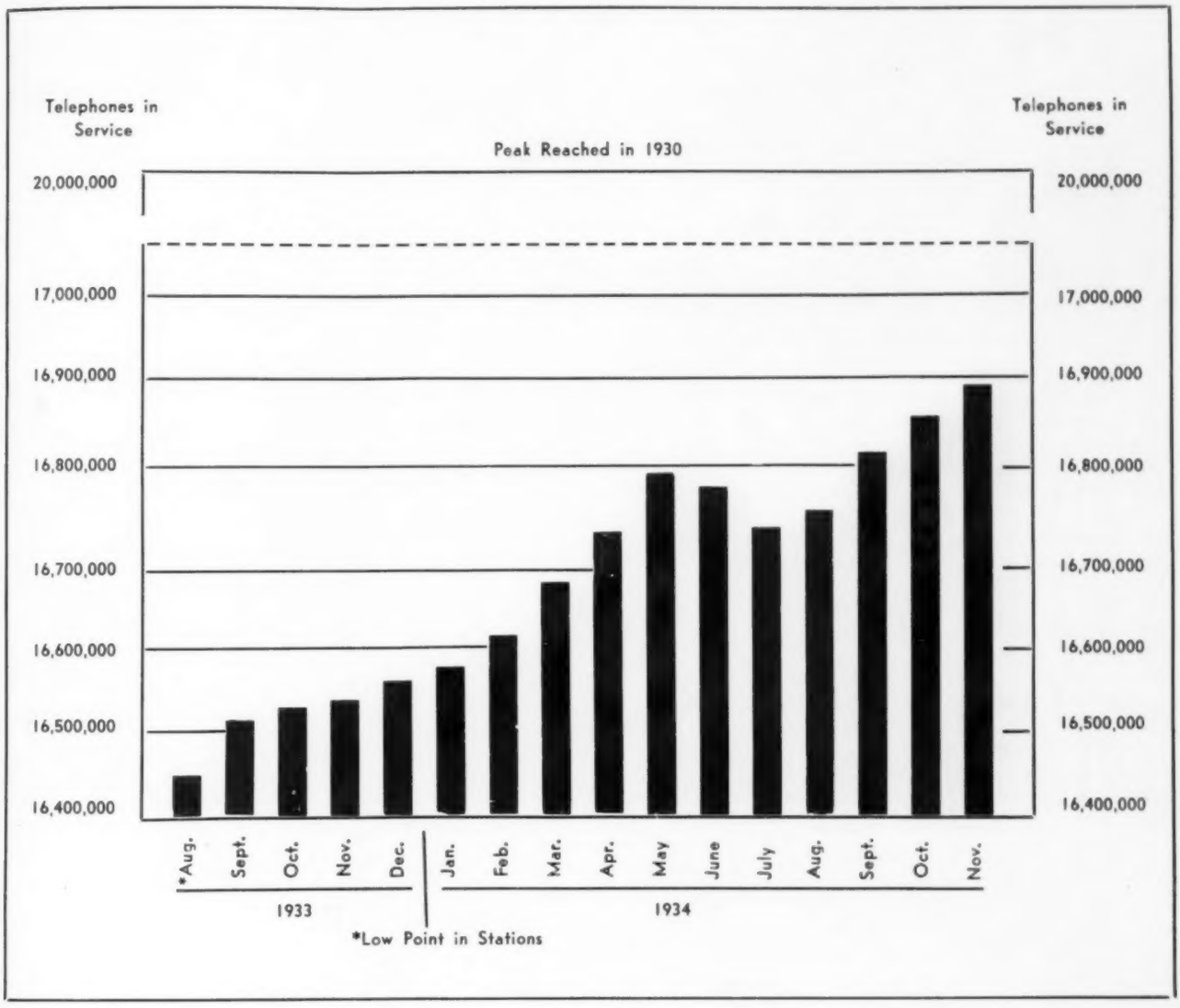
Wiring between switches and repeaters and the power shelf is done through the tubing of the frame.

This type of frame permits access to the equipment both in the front and in the rear, all switches and apparatus being mounted on one side of the frame only.

Special frames were built in the shop of the telephone company. The dial telephone equipment was furnished by American Automatic Electric Sales Co.

The building is heated with a No. 65 Vented Reznor Circulator. This is a gas heater equipped with a fan. The gas is burned inside a radiator which is connected to a flue. The electric fan forces the air over the outside of the heated radiator. This heater is equipped with a thermostat which can be adjusted to maintain a temperature within limits of 40 degrees and 80° F.

Monthly Telephone Station Barometer



FOR the past 15 months there has been a consistent gain in telephone stations. It is predicted that December will produce a net gain. This year's performance leads telephone men to face 1935 with renewed enthusiasm.

This gain, pictured by the above chart, can hardly indicate anything else than a definite and steady improvement in the financial status of a considerable mass of citizens. The man who orders a telephone installed in his home or office is a man whose finances are getting better. A long continued pick-up in telephone installations is pretty clear proof that somehow, somewhere, things are on the up-grade.

LINE and DESK

Ray Blain, Member A. I. E. E., Editor

Q.—Is it possible to use the hammer drive type anchor to attach porcelain knobs to a brick wall?

A.—The drive anchor can be used successfully for this purpose, providing a cushion type washer is used to prevent injury to the knob while the anchor is being set.

Q.—When can a switchboard without line relays but with cut-off jacks be considered satisfactory?

A.—This arrangement is seldom used these days though it can be considered satisfactory when the subscribers' lines are comparatively short and of nearly uniform length.

Q.—Is a water pipe ground considered satisfactory for a medium sized common battery exchange?

A.—There seems to be no reason why this type ground would not be satisfactory providing the cold water pipes are in good condition, the ground lead of sufficient size and one of the special clamps used to make the connection to the pipe.

Q.—When splicing drop wire should both rubber and friction tape be used?

A.—We believe this practice necessary as the insulation is always lower at a splice and the use of both rubber and friction tape will probably prevent transmission losses.

Q.—Can the intermediate type drop wire clips be removed so that they may be reused?

A.—They may if proper care is exercised in their removal so that they are not damaged. The projections on the clip should be bent forward and the top sides bent back wtih diagonal pliers. If this operation is carefully carried out the clip will be restored to practically its original form and may be reused.

Q.—What rule should be followed in protecting long aerial lines where they connect to the exchange cable plant?

A.—Some companies protect all lines of one half mile or longer where they connect to the cable terminal though aerial lines of even shorter lengths should also be protected if it is considered that they are a possible source of trouble from lightning. Protected cable terminals can be used and they generally prove desirable when over six or eight miles require protection. When only three or four lines in one cable terminal need protection then it will probably be best to install an unprotected cable terminal and separate protectors of the pole type for the lines requiring protection.

Q.—We desire to build a wooden battery rack to support a sealed glass jar type battery and want to paint it aluminum to match other equipment. Will this paint be satisfactory?

A.—The usual practice is to paint battery racks of this type with acid resisting paint such as black asphaltum. However, we see no reason why a rack can't be painted aluminum for a battery of this type. The sealed glass jar battery when properly maintained should be dry over the entire surface of the cells at all times. Care should be exercised to prevent spilling of electrolyte when taking gravity readings with the syringe type hydrometer.

Q.—What method is recommended for crossing a building overhang which carries a metal gutter, with a parallel drop wire?

A.—The crossing of such obstructions with a drop wire should be avoided where possible for it is practically impossible to make a satisfactory drop attachment on the metal gutter. When these crosisngs cannot be avoided, an attachment should be placed as near the top and under side of the gutter as possible, the wire taped where it comes in contact with the metal, using three layers of rubber and three of friction tape, and then pulled tight. Such installations if well made seldom cause trouble.

Q.—How should pair numbers be indicated on main frame protectors?

A.—The arrangement generally used is to stencil the pair number on the spring surface just back of the heat coil, on each fifth pair. These numbers are placed on the jumper side of the protector. Sometimes the spring is painted white and then the black numbers stenciled on it though this is hardly necessary as the black number will show up well directly on the light colored metal. Sometimes the pair designation is placed on the fanning strip though this method is not recommended for it is difficult to associate the proper pair with the number and frequent mistakes are made in jumper running.

Q.—Switchboard cords are generally of alternate colors, white, green and red. Why would it not be desirable to have some color scheme whereby the answering and calling cords could be distinguished from each other?

A.—The best scheme we know of along this line is to use black plug shells on answering cords and red shells on calling cords. Some recent switchboards make use of this scheme and it seems to be of some assistance to operators when working on an exceptionally busy position as recalls can be traced easily.

Q.—When is it considered desirable to reuse old lead covered cable that has been recovered from the plant?

A.—This is a question which must be decided after due consideration of all facts in each case. Personally we do not consider it either desirable or economical to re-use any old lead covered cable that has been in service for any length of time for usually the cost of repairs after placing in service will soon offset any saving which may be realized in the first cost of the cable. The sheath of aerial cable will generally oxidize and stiffen after it is in service for a time and when this cable is taken down and rolled on reels it will have a tendency to become porous where it is bent. Such cable when unrolled again and pulled into either rings or underground duct line will generally cause trouble. Cable removed from underground will probably not be crystalized or porous but there is ever possibility that it will be damaged in the removal operation so that trouble will soon result after again being placed in service. Old cable usually has numerous sleeves, where splices have been made, which must be cut out when it is removed and this usually makes lengths inconvenient for reuse. The clearing of cable trouble is always expensive and such trouble so detrimental to telephone service that it is not believed that the reuse of old cable will in general prove economical unless special conditions pertain.

Angle Stromberg Head; Scoville General Manager

STROMBERG - CARLSON directors elected Wesley M. Angle as president and George A. Scoville vice president and general manager, to take over the duties of W. Roy McCanne, former president of the company, who died November 5.

Lee McCanne will take his father's place on the board and was named secretary, and Walter L. Todd, president

G. A. Scoville, General Manager

of the Todd Co., was elected to the directorate.

The men now advanced to more responsible positions have been with the company many years and are part of a group of executives which Mr. McCanne built up during his years at the head of the Stromberg-Carlson company.

Mr. Angle entered the employ of the Stromberg-Carlson company immediately after graduation from Harvard in 1903. He was successively cable machine operator, stockroom clerk, assembler and cost clerk in his early days with the company. In 1907 he was appointed assistant secretary and a year or two later became assistant treasurer, in which capacity he had charge of credits and collections and likewise acted for a number of years as office manager. In 1914 he was elected a member of the board and named secretary, becoming vice-president 10 years later. Among other duties he has been active in matters of employee relations.

Mr. Scoville, who as general manager will have general supervision of sales, advertising and production, has been associated with the telephone industry since 1903 when he completed the electrical engineering course at Stanford University and entered the shop of Western Electric Co. After advancing to the installation division and again to the engineering division, he next became associated with Dean Electric Co. and its successors, Garford Manufacturing Co. of Elyria, O., serving as sales engineer and sales manager of the latter concern. In 1916 he joined the Stromberg-Carlson company as sales manager, becoming a director of the company in 1920 and being made a vice-president in 1924.

Mr. Scoville is a director of United States Independent Telephone Association and also is chairman of the Telephone Manufacturers Section as well as chairman of the supervisory agency of the Telephone Manufacturers, the group administering the code for the Telephone Industry. Despite long connection with the telephone industry, he has been concerned with the radio business of the Stromberg-Carlson Company since 1922, when the company entered the radio manufacturing field. He is thus not only well known to telephone men everywhere but is personally acquainted with radio dealers throughout the country.

Lee McCanne, the new secretary, was graduated from Massachusetts Institute of Technology in 1929 and since that time has been associated with Stromberg-Carlson, having occupied positions in both the engineering and sales departments. Recently he has been engaged in sound system promotion work and he will continue while acting as secretary to be responsible for a large share of the company's radio development.

Due to the re-arrangement of work, additional responsibilities will be carried by Edward A. Hanover, vice-president in charge of production and Dr. Ray H. Manson, vice-president in charge of engineering.

Mr. Hanover first entered the company's employ in Chicago in 1901. For years he has acted as purchasing agent, and recently has also been responsible for conducting the company's manufacturing operations. He also exercises general supervision over broadcasting

W. M. Angle, President

station WHAM which is owned by Stromberg-Carlson.

Doctor Manson has been connected with the telephone industry since 1899, having been employed successively by the Western Electric, Kellogg, Dean, Garford and Stromberg-Carlson companies. He has been chief engineer of the latter company since 1916 and is prominent among telephone and radio engineers, having served at one time as president of the Institute of Radio Engineers. During his years in the telephone and radio industries he has made many inventions and has had issued to him a very large number of important patents. Both he and Mr. Hanover have been on the Stromberg-Carlson directorate the last 10 years and have been vice-presidents since 1929.

Other executive officers are Edwin C. Roworth, treasurer and assistant secretary, and Wilbur W. Wetzel, assistant treasurer and auditor.

Cellograph Halftone by Schoenwald

Lee McCanne, Secretary

BUSINESS-LIKE ADVERTISING IN BEHALF OF LONG DISTANCE

AIMED at business executives through the pages of national magazines, Long Distance advertising is itself business-like, factual, direct. Each advertisement is based upon the actual experience of one or more companies. Each shows how Long Distance has cut costs . . . increased sales . . . or speeded up service to customers. Text includes specific figures, quotations from company officials, and a list of typical rates.

The advertisement on the opposite page, appearing during December, is an example from this series. It should help to stimulate traffic to the benefit of the entire telephone industry.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

"95% OF OUR SELLING IS DONE BY TELEPHONE"

Middle Western company builds an annual sales volume of $4,000,000 . . . another example of what Long Distance can accomplish

WITH 95% of all selling done by telephone, the Chicago office of the Altitude Petroleum Corporation increased its annual business from $5000 to $4,000,000 in ten years. Under its merchandising plan, the salesmen travel their territories to develop leads rather than make actual sales. The date the customer will be in need of supplies is reported to the home office. Then the telephone is used to close the order.

"Our customers like this method of contact," says the Sales Manager. "From the day we started we have steadily increased volume and profits. Every customer is called every three weeks or oftener, and the speedy service we give, because of our use of Long Distance, is a large factor in our success."

American business records include many stories of companies that have based substantial growth on their *every-day* use of Long Distance Telephone Service. Long Distance contributes to success because it saves time, gets things done, costs little. Companies of every size report that it brings results.

You will find that the *planned, systematic use* of Long Distance for every department of your business — purchasing, accounting, traffic, production, executive — is a means to increase profits . . . speed up service . . . lower operating costs. Telephone your local Bell Telephone office today. A representative will call to explain the various ways in which your concern can successfully use Long Distance.

TYPICAL STATION-TO-STATION RATES

FROM	TO	DAYTIME	7 P.M.	8:30 P.M.
Pittsburgh	Cleveland	$ .70	$ .60	$ .40
Minneapolis	Denver	2.75	2.25	1.50
Boston	Chicago	3.25	2.65	1.75
New York	Kansas City	4.00	3.25	2.25
New Orleans	San Francisco	7.00	5.50	4.00

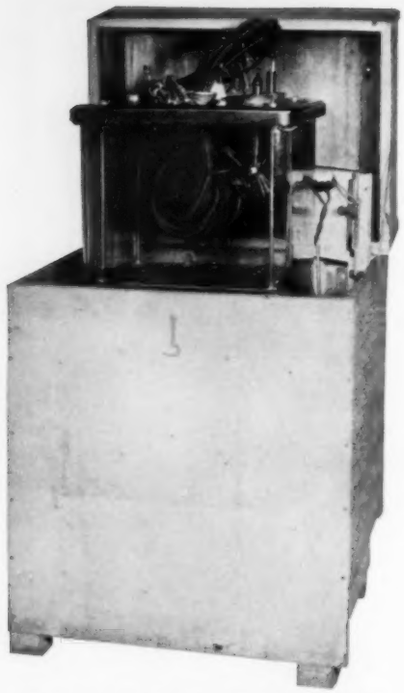


Fig. 1. Humidity Tank Used For Insulation Tests Under Extreme Conditions of Moisture.

A "Proving Ground" for Telephone Cords

By
K. W. GRAYBILL
Associated Electric Laboratories, Inc.

● Laboratory tests concentrating years of normal service into a few weeks are invaluable in giving operating companies cords with features which make for durability under severe conditions.

TELEPHONE cords present far more problems to challenge the ingenuity of the design engineer than are evident to the casual observer. Cords are not only subject to usage under almost every imaginable condition of atmospheric moisture and dust, but are also frequently abused by careless handling. The actual destruction of cords by abusive treatment constitutes one reason why expensive construction features cannot be used in the design of cords.

To determine the most suitable design characteristics—whether of a telephone cord or any other pieces of apparatus — it is usually possible for a modern research laboratory to duplicate, with a fair degree of fidelity, many years of normal use in a relatively short time. An investigation of this character was recently conducted by Associated Electric Laboratories, Inc., to determine the best designed characteristics to be incorporated in telephone cords now being manufactured by Automatic Electric Co. This work was intensely interesting as an engineering investigation and it is thought that a description of some of the laboratory methods used will be of interest to those in other branches of the telephone industry.

Some of the more common characteristics of cord construction are so well known that they will either be merely mentioned or neglected entirely in the discussion to follow. For example, the "tinsel rope" conductor used in flexible cords is so well known that it needs no detailed description here. It is sufficient to point out that many years of experience, aided by comparatively recent improvements in the metal alloy and the form of metal ribbon used, have provided a tinsel rope that is practically free from trouble. The insulation of the tinsel with silk, which is in turn impregnated with an asphalt compound and covered with an outer braid of cotton, is ordinary practice in cord construction, but the exact procedures followed and the exact materials used can be varied to produce great differences in the insulation resistances between conductors and in other cord characteristics.

The arrangement of the individual conductors in the cord assembly, as well as the material and structure of the outer braid, affect the flexibility of the cord, its insulation resistance and its resistance to abrasion. The most favorable conditions for each of these variables can only be determined by careful and thorough laboratory tests.

Telephone cords must be softly flexible; must withstand repeated flexing without breakage or kinking; must maintain high insulation resistance between conductors even under conditions of continuously high relative humidity; and must resist abrasion of the outer covering resulting from contact with sur-

(*Please turn to page 28*)

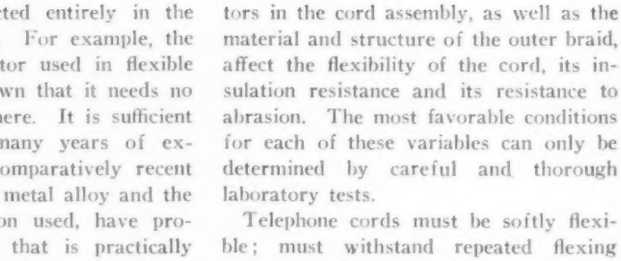


Fig. 2. Galvanometer Setup for Making Insulation Resistance Tests.

They put "LUNGS" in a battery

to give you a more practical, economical form of current supply for operators' transmitters

Operators' transmitters are fussy. Over-voltaged, they "burn" and have short life; under-voltaged, they talk in whispers. The voltage must be "just right" for best results and longest transmitter life.

The Eveready Air Cell Battery, No. T-600, caters to this exacting demand for practically constant voltage. It is provided with carbon "lungs" to breathe the vital, voltage-sustaining, depolarizing oxygen into the battery from the inexhaustible supply of all outdoors. Hence, no falling of voltage due to depletion of the depolarizer, which is what happens in dry cells. Putting a group of dry cells in a box won't change their nature. The voltage of such a battery is "just right" only for a short portion of its life.

The Eveready Air Cell Battery is conservatively rated at 600 ampere-hours. On a transmitter drawing 100 milliamperes, this is equivalent to *6000 talking hours*, every hour at peak transmission, because the Air Cell's voltage is "just right" throughout its unusually long life.

The Eveready Air Cell is a caustic soda battery, but unlike other forms of such batteries, it comes to you completely assembled, sealed up, ready to go, upon the mere addition of ordinary drinking water. (The battery is shipped dry). No jars, covers, elements, etc. to assemble; no stirring of chemicals, no messy cleaning jobs. Just fill with water and it is ready for service. The Air Cell takes up a lot less room, too.

This remarkable battery has six outstanding advantages over any other form of primary battery . . . Unusually Long Life. Practically Constant Voltage. Compactness. Excellent Appearance and Cleanliness. Low Cost Per Ampere-Hour. Easily Activated For Service.

NATIONAL CARBON COMPANY, INC.
GENERAL OFFICES: New York, N. Y.
BRANCHES: Chicago, San Francisco
Unit of Union Carbide UCC *and Carbon Corporation*

SEND FOR THIS FREE BOOK

National Carbon Co., Dept. T. E. 12
30 East 42nd Street, New York City.

Please send me a FREE copy of your new book, "Transmission Improvement in the Local Battery Exchange," by B. C. Burden — well-known writer on telephone operation problems.

Name_____

Address_____

Fig. 3. Device Used for Measuring Force Required to "Kink" Cords.

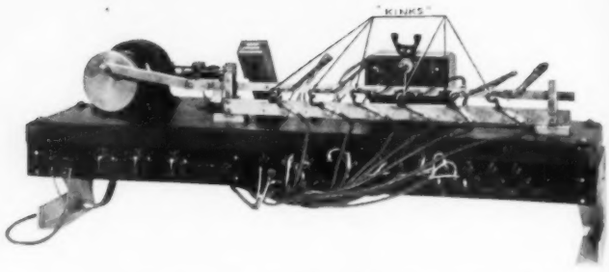


Fig. 4. Machine for Testing Cord Durability Under Forcible "Kinking" Conditions.

(*Continued from page 26*)

rounding objects. For obvious reasons, artificial and accelerated tests must be conducted to disclose the value of proposed methods of construction.

The insulation resistance between conductors of a cord must be high to avoid unnecessary transmission loss and interference with supervisory or control operations of the central office equipment. Tests to disclose insulation resistance are conducted by exposing the cords to an atmosphere of approximately 98 per cent humidity at a temperature of 95° F., and measuring the leakage between conductors by means of a galvanometer with 100 volts D. C. applied. A typical tank for such laboratory procedure is shown in Fig. 1, and the galvanometer set-up is shown in Fig. 2. Accurate results from such a test are possible only when precautions are taken to avoid condensation of moisture on the cords by providing adequate control of the "atmosphere" and suitable suspension for the cords.

The quality and purity of materials used and the detail manufacturing processes by which these materials are assembled into the individual conductors are of the utmost importance in obtaining high insulation resistance. The straight, parallel assembly of conductors without any filler material provides a slight advantage as compared to the twisted assembly including fillers to produce a cord of very round cross-section. Even the material and construction of the outer braid is a factor of some importance in securing high insulation resistance between conductors.

Telephone cords must be flexible enough to avoid inconvenience to the telephone subscriber. Too soft and flexible a cord will ordinarily have a comparatively short life. Another characteristic related to that of flexibility is the objectionable tendency to form permanent "kinks". Flexibility and the tendency to kink were examined by merely handling cords, by placing cords in service on telephones used by critical observers, and by measuring the force required to kink a cord around a certain diameter of brass tubing. In this latter test, the brass tubing was slotted and a record was made of the pull required on one end of the cord to just close the slot, as illustrated in Fig. 3.

To make this test of value it is necessary to choose a brass tube of such diameter, wall thickness and width of slot, that the major part of the pull exerted is that required to kink the cord rather than close the slot. Almost every detail of cord construction is a factor in determining the flexing and kinking characteristics of a cord. The material used, the tightness of wrappings or braidings, and the position in which the conductors are assembled, are examples of important factors determining these characteristics. It is found that straight parallel placing of conductors combined with good materials and construction practices produces desirable flexibility accompanied by an unusual degree of resistance to permanent kinking.

Forcible kinking of a cord is one form of abuse in service that is frequently encountered. It was considered desirable to determine what construction characteristics offer greatest resistance to failure under such abuse. The test machine illustrated in Fig. 4 was used to kink and unkink cords of different designs repeatedly to obtain such information.

The kinking machine in Fig. 4 also serves as a very acceptable method of judging the strength and wear resistance of outer braids and conductor braids, as well as serving as an auxiliary apparatus during insulation resistance tests. Merely testing cords for insulation resistance after exposure to high humidity is not considered sufficient. The regular test procedure alternates periods of exposure to humidity with periods of flexing in the machine shown in Fig. 4. This flexing tends to open up impregnating material and insulation somewhat as actual service will and this tends to disclose weaknesses in design which result in low insulation resistance.

The outer braid of a cord is subject to frictional wear as it repeatedly rubs against a desk or other objects and is also subject to breakage due to kinking. Tests in the kinking machine in Fig. 4 are helpful in determining the resistance to breakage from this source. Tests for resistance to abrasive wear are conducted on the type of machine illustrated by Fig 5. The test shown in Fig. 5 rotates a drum against which the cords are held with a fixed load or pressure. The usual measure of life is the record of the number of hours a cord will run on this test before a single strand of the outer braid is worn through.

While the above discussion describes in a few words one of the latest and most up-to-date procedures followed in selecting the design features of telephone cords, it does not adequately indicate the time and effort necessary to achieve the final result. Engineering studies such as this proceed for months with a great deal of tedious testing and and recording of data, additional hours

(*Please turn to page 34*)

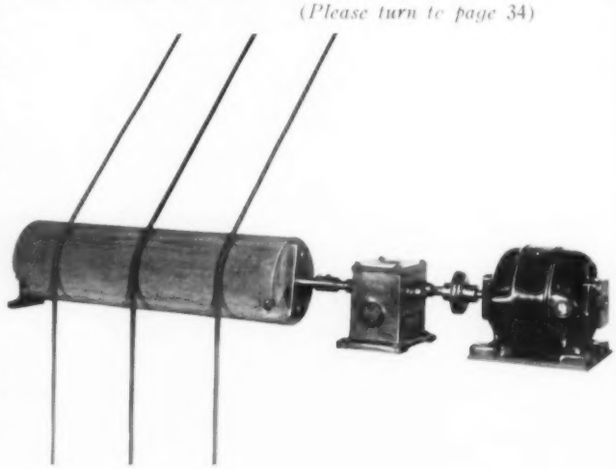
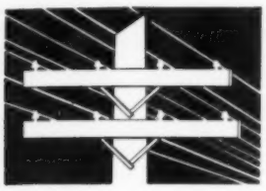


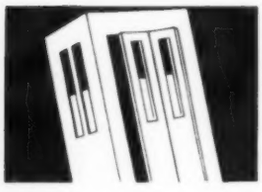
Fig. 5. Machine for Testing Resistance of Cord Covering to Abrasion.

FOR EVERY TELEPHONE NEED..



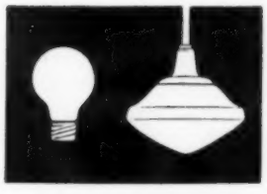
LINE MATERIAL... A single insulator. Or miles of pole line. Graybar can supply construction materials and tools for *any* telephone need. Quickly and economically.

EXCHANGE EQUIPMENT... Exchange equipment of many types is readily available from Graybar. Equipment from Graybar is standard, quality equipment. Write for more detailed information.



OUTSIDE EQUIPMENT... Equipment used outside of the exchange can also be had from Graybar. Note:—you'll find a Graybar distributing house right in your vicinity.

LAMPS AND LIGHTING... Good lighting is essential to good telephone service. Graybar's line of fixtures and glassware is unusually complete and up-to-date. Let a Graybar lighting specialist advise you.



EVERYTHING ELECTRICAL . . . Graybar, with its 65 years of experience, stands out as the logical source of anything and everything electrical. Write us for information on electrical supply problems.

..60,000 electrical items

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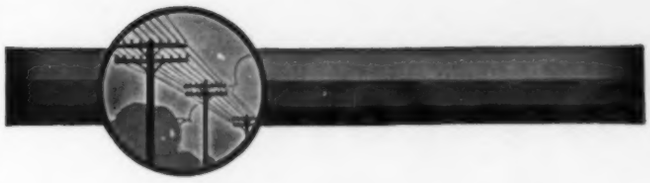

Phillips Telephone Cords for Economy

Both by repeated tests as well as under actual conditions of service, Phillips telephone cords show an extraordinarily low cost per year of service life. This is because of the exclusive method of construction used and the careful selection of materials with which they are built.

Everybody knows how ragged and frayed ordinary cords soon get. Phillips cords do not begin to show signs of wear until long after others have been discarded. They are covered with a newly-developed, tightly-woven material to form a compact, smooth, silk-like braid, which retains its attractive appearance even after years of hard service.

Phillips cords will not form a permanent kink. Thus another frequent source of wear is eliminated. And their insulation resistance is not only high to begin with, but remains high even under the most severe conditions.

For a new experience in cord economy, specify Phillips cords on your next requirements.

PHILLIPS PRODUCTS INCLUDE:—Bare and Insulated Copper Wires—Rubber Insulated Wires—Enameled Wire—Magnet Wire —Power Cables—Switchboard Cables—Paper Insulated Cables — Flexible Cords — Electrolytic Copper Rods, Shapes, etc.

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Association Explains FCC Questionnaire 11450

IN HIS letter of December 6, President F. B. MacKinnon of the United States Independent Telephone Association, explained to its members the procedure in filling out FCC Questionnaire (Form 11450) relative to telephone companies exempt from the Communications Act. The letter follows:

"The Federal Communications Commission is sending letters out to those Independent companies that have claimed exemption under Paragraph (b) of Section (2) of the Communications Act. Many companies wrote to the Commission explaining they considered themselves exempt and should be classified as "Connecting Carriers", but have received no reply to their letters or statements. The Commission is now replying to those letters by a circular letter which asks for certain information which will enable the Commission to classify the companies. The essential questions covered by the questionnaire (Form 11450) which the company is asked to sign and certify to are (1) whether the company is controlled by any outside company; (2) whether the company owns a toll line across a State line; and (3) whether it has an exchange on a State line so that the exchange lines are in two States, and if so, whether those exchange lines in the two States are under the control of a commission or other regulatory body.

"Great care should be exercised in answering these questions. If a larger company owns a block of stock in your company, you should explain in a separate statement, if necessary, what percentage of the voting stock that interest represents and how the remaining stock is held. If you confine your answer to stating, as the question is asked, a list of those owning over 1% of the stock, and the outside interest, a Bell company for example, owns a block of stock that is only 15% or 20% of your stock, you may by your answer indicate that the Bell company has the controlling interest. Where there is such a holding by an outside company you should explain how many other stockholders you have and whether the control rests in the hands of one group, either related by family attachments or by common financial interests. The essential point in asking these questions by the Commission is to determine whether, if your company is not itself engaged in interstate business by means of exchanges and toll lines which it owns, it is engaged by means of the toll lines and exchanges of a company which controls it. If the latter be the case, under the law it is to be classified as a non-exempt company. This control may not be held by a Bell company. It may be held by another Independent company directly or through a common holding company. Therefore, great care should be exercised in explaining the ownership of a block of stock in your company by an outside organization.

"In answering the question as to the ownership of a toll line running across a State line, you should also go into detail in explaining whether that toll line connects with an exchange owned by you, so that you can complete a call entirely with your own facilities, or whether it is a part of a toll line, the other part of which is owned by another company. It may be a joint ownership. Most of the smaller companies, however, own the toll line to the State line or to a junction point, the remainder of the line being owned by another Independent company. You should be very careful in explaining how far the toll line that you own runs and with whose toll line it connects, and that the company with which you connect in that way is not owned by you or does not own you, or is not affiliated with you through a common ownership.

"The third question, that of operating exchange lines across State lines, should be also carefully answered and your exact situation described. The question of "other regulatory body" than a State Commission, which may have jurisdiction over the exchange lines in one of the States, should be explained by you in detail. This control may be by municipal franchise instead of through a State Commission. Just how your rates and services are controlled should be explained.

"As I have said, in answering these inquiries remember that upon your answers the Commission will base its classification of your company as an exempt or non-exempt company. Do not hesitate to attach letters or sheets giving full explanations, so that the Commission may understand exactly what your situation is. If you have already answered the questionnaire and sent it to the Commission, and did not reply to the questions in detail as we have suggested, you should write a statement giving the necessary details and send it to the Commission asking that it be attached to your original statement.

"We urge all companies receiving these letters of inquiry to answer them promptly and fully. The Commission is entitled to know under what conditions you are operating and to what extent you are subject to its jurisdiction."

Commission Issues Order No. 11

ORDER NO. 11

The Telephone Division having under consideration Sections 215 (a), 215 (b), 215 (c), 218 and 403 of the Communications Act of 1934, and it appearing that Section 215 (a) requires that the Commission shall examine into transactions of telephone carriers relating to the furnishing of equipment, supplies, research, services, finances, credit, or personnel; that Section 215 (b) requires that the Commission shall investigate the methods by which and the extent to which wire telephone companies are furnishing wire telegraph service and wire telegraph companies are furnishing wire telephone service; that Section 215 (c) requires the Commission to examine all contracts of carriers subject to this Act which prevent the other party thereto from dealing with another common carrier subject to this Act and shall make a report thereon to Congress; that Section 218 provides that the Commission may inquire into the management of the business of all carriers subject to this Act, and shall keep itself informed as to the manner and method in which the same is conducted, and as to technical developments thereof; and that Section 403 authorizes the Commission to institute an inquiry, on its own motion, as to the foregoing:

IT IS ORDERED, That the Division, on its own motion and without formal pleading, enter upon a proceeding of inquiry and investigation into and concerning such transactions, methods, contracts and management of the business of telephone carriers subject to the Communications Act, for the purpose of making such a report to Congress, and for the further purpose of carrying out any provisions of the Communications Act and making such findings or issuing such orders as may be appropriate thereunder.

IT IS FURTHER ODERED, That copies of this Order shall be served upon all telephone carriers subject to the Act, and that such carriers be made respondents to this proceeding; and that copies of said Order be sent to the Governor of each State and to each State regulatory body having jurisdiction over telephone carriers.

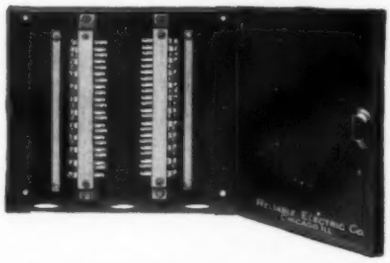
In connection with Order No. 11 the FCC announced its inquiry would begin with an investigation and study of the corporate history and financial structure of American Telephone and Telegraph Co., including connections and relationships with associated Bell Companies and other subsidiaries of A. T. & T. This examination will also include subsidiaries which manufacture equipment and supplies for the parent company and for associated Bell Companies, including all subsidiaries or related companies which affect the communications industry, under jurisdicition of the Commission. Examination will include financial arrangements between A. T. & T. and its subsidiaries, and the agreements, financial and otherwise, of the various subsidiaries with each other.

Public hearings will begin some time after January 1.

With completion of testimony of witnesses of A. T. & T. and its subsidiaries, witnesses will be heard from Independent telephone companies which come under jurisdiction of the Communications Act. This inquiry will be directed at the financial structures, services, agreements, and contracts of

(*Please turn to page* 35)

STEEL BUILDING BOXES



Type "E" Manufactured in All Sizes

NEATLY DESIGNED.

NUMEROUS KNOCKOUTS AT TOP AND BOTTOM.

SCREW BINDING POSTS FOR DISTRIBUTING WIRES.

SOLDERING TERMINALS FOR CABLE WIRES.

Reliable Electric Company

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The Solution of Your Ringing Problem

INSTALL IT — THEN FORGET IT

30-DAY FREE TRIAL

ONLY ONE CONTACT!

PRICE $44.00 EACH
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LOW — COST
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No Radio Interference

Current consumption negligible.

Directly converts commercial alternating current to telephone ringing current.

Sold by Leading Telephone Distributors

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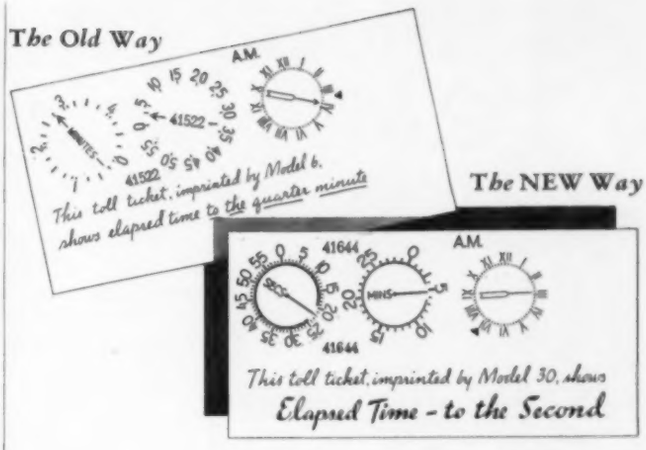


How the NEW CALCULAGRAPH

PRINTS ELAPSED TIME TO THE SECOND

As everybody in the telephone world knows, the Model 6 Calculagraph prints toll call elapsed time to the quarter of a minute.

Now, to cut still further the overtime allowances on toll messages, the new Model 30 Calculagraph **prints elapsed time to the second.**

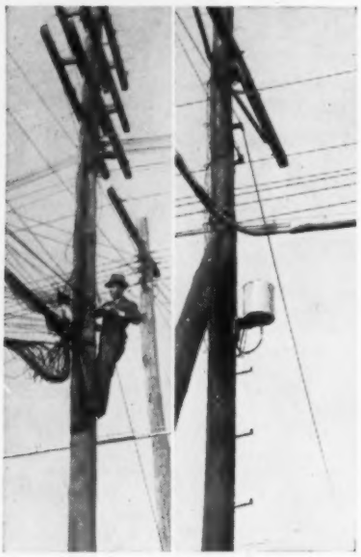
This new model is equipped with a self-starting synchronous motor for 60 cycle, and either 20 or 110 volts regulated, alternating current. The mechanism is so designed that it can be fitted to the Model 6 spring-driven Calculagraph at a reasonable cost.

Sample imprints sent anywhere in the world on request. Please state the serial numbers of Calculagraphs now in use in your exchange, and estimates for converting them to the Model 30 will be provided.

THE CALCULAGRAPH COMPANY
50 Church St. Dept. 16 New York City

CALCULAGRAPH
THE ELAPSED TIME RECORDER

MODERNIZE



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PROTECTED OR UNPROTECTED TERMINALS

Low First Cost
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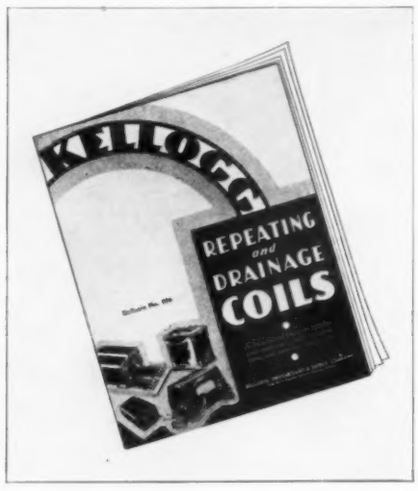
A PERFECT MEANS OF TERMINATING AND DISTRIBUTING LEAD COVERED CABLE.

COOK ELECTRIC CO.
CHICAGO

New Repeating Coil Bulletin Ready

A new Kellogg Repeating and Drainage Coil Bulletin is ready for distribution. This bulletin discusses phantom, simplex and composite circuits, transpositions and inductive interference. Coils and transformers for these purposes are listed and their usages explained. Comprehensive circuits show how they are used and why.



The bulletin was necessitated by the many changes that have been made in old repeating coils and equipment and because of new ones recently introduced. Among new equipment introduced in it, is the 21-A Repeating Coil. This talk and ring thru coil is a new design providing a high type of service on phantom or simplex lines.. It has a flat frequency charactersitic of from 50 to 5000 cycles and is extremely efficient on 16⅔ cycles ringing current. The new core of laminated nickel-iron aloy is an important improvement over older type coils and permits a high efficiency on both talking and ringing current. In addition to these advantages it is also smaller in size than similar coils of older design.

Where additional facilities are necessary, good phantom circuits save an expenditure many times greater than the cost of the few coils and arresters necessary for their installation. At the same time their use adds considerable revenue to the operating company's income. Consequently, because this bulletin shows newest types of coils and and equipment, it will prove of considerable value in helping engineers operate phantoms to the best advantage and greatest economy.

Complete details regarding transpositions with diagrams and illustrations to clarify methods used are given. "grounding" and "drainage" diagrams are shown for various types of phantoms work. Yet, information regarding the more complex work, including telegraph, is given so that this bulletin covers the entire subject quite fully. Complete equipment, including composite ringers and telephones, howlers, mounting brackets, arresters, transposition brackets etc., is listed and described.

Those telephone men specifically interested in the subject, or whose conditions require such equipment should write Kellogg Switchboard and Supply Co., Chicago, for Bulletin No. 206.

FCC Issues General Order No. 8

The FCC handed down general order No. 8 on December 7. It follows:

"It is ordered that the regulations prescribed in commission order No. 4 adopted on October 9, 1934, as amended in commission order No. 7 on November 2, 1934, apply to any person authorized by or undertaking for each of two or more carriers to perform the duties, or any of the duties, ordinarily performed by a director, president, vice-president, secretary, treasurer, general counsel, general solicitor, general attorney, comptroller, general auditor, general manager, general commercial manager, chief engineer, general superintendent, general land and tax agent or chief purchasing agent."

W. H. Bryant, Pioneer Passes Away

William H. Bryant, Mobile, Ala., pioneer Independent telephone man, died December 10 following a six weeks' illness. He was born July 27, 1869.

Mr. Bryant in his early life was connected with the Bell Company and the Home Telephone Co. at Mobile. Later he entered the electrical supply business in that city.

For the past several months Mr. Bryant has been Southern Field Secretary of the United States Independent Telephone Association and aided in the forming of state associations in Kentucky, Virginia and West Virginia.

H. I. Crawford Dies

Howard I. Crawford, district manager of the Commonwealth Telephone Co., Wausau, Wis., passed away December 6 following a heart attack.

Carlis Elected

At a meeting of the board of directors of the Ohio Independent Telephone Association held in Columbus, December 3, T. C. Carlis, general manager of the Ohio Associated Telephone Co., Marion, was elected a member of the board.

Telephone Pole, Equipment Marking Plan

(Continued from page 11)

1. **First pole and last pole on the line.**
2. **First pole and last pole on private property.**
3. **Junction poles and poles adjacent to junction poles.**
4. **Poles at each side of highway crossings, river crossings, railroad crossings and at such other locations as may be considered necessary, and on every fifth pole in the line.**

Line numbers should be placed on—

1. **First pole and last pole in the line.**
2. **Poles adjacent to junction poles.**
3. **Poles at each side of highway crossings, river crossings and at such other locations as may be considered necessary and on every twenty-fifth pole in the line.**

Ownership tags and numerals should be placed on the side of the pole from which they may be seen in the ordinary course of travel, and so that no part of the markings will be less than 5½ feet from the ground, in the following order:

Line number on top.
Ownership tag below the line number.
Pole number below the ownership tag.

Fig. 1 illustrates the pole marking plan described above in detail. Fig. 2 is a table showing quantities of individual figures required for various series of numbering.

The need of railroads for systems of marking that will give permanent and legible identification extends to many of their properties. Railroads find that aluminum markers are ideal for their use as they resist corrosion and rust and are affected but little by soot and smoke, prevalent along the right-of-way.

Most railroads find it advantageous to use metal characters for:

1. **Mile post marking.**
2. **Numbering and ownership identification of poles.**
3. **Transposition marking.**
4. **Marking dispatcher's and message circuits.**
5. **Numbering signal masts.**
6. **Marking rolling stock.**
7. **Marking bridges and culverts.**
8. **Designating stores, bins, sections, etc.**
9. **Marking tool houses, bunkers, sheds, other structures and miscellaneous equipment.**

Oil line companies use metal markings extensively. Among their equipment and properties marked for ownership and location identification are poles, pumps, machines, engines, buildings, terminals and terminal boxes, wells, etc. Perhaps the greatest use of markers is in the telephone and telegraph systems of the oil pipe line companies, which are constructed and maintained by the companies themselves.

Many of the oil companies who own the longer pipe lines identify the lines at cross roads, which is deemed necessary because of back fills, which often completely cover the line. For this identification metal rods or posts are driven in the ground, on the top of which are mounted identification plates.

The subject of a competent, reliable, permanent and economical identification marking procedure is an important one in the operation of public utilities and similar industries and considerable attention and study should be given to an efficient plan as well as the type of marking equipment to be used.

The writer wishes to acknowledge the cooperation given to him by the Premax Sales Division of the Chisholm-Ryder Co., in permitting the reprinting of information from its copyrighted book, "Property Marking Systems for Public Utilities," and also to the Up-State Telephone Association of New York.

SEND FOR FREE BOOK
On Property Marking

Public Utilities are depending more and more on PREMAX METAL MARKERS, LETTERS and FIGURES for economical permanent identification. Their requirements have been carefully studied by Premax engineers, and today there is a complete, low-cost system available for every type utility.

Standard and Special Designs

Embossed aluminum and brass Letters and Figures in many styles have been adopted by telephone companies everywhere as standard marking because of their legibility, permanence and economy. Cost figures show that they are often cheaper to install than the old-type stencil method—and far more lasting.

Get the Facts — They Will Save You Money

Send today for the book, "Property Marking Systems For Public Utilities." It will explain the methods now in use by leading telephone companies. The samples accompanying the book will illustrate the permanence and low cost of the Premax Markers.

PREMAX SALES DIVISION
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NEWS OF THE MONTH

The telephone exchange of the St. James (Minn.) Telephone Co. was completely destroyed by the recent $250,000 fire.

Thousands of dollars damage to telephone, telegraph and electric lines was caused by the sleet and snow storm that swept Neillsville section of Wisconsin the latter part of November.

Arthur L. Croft, general commercial manager of the United Telephone Co., with offices in Harrisburg, Pa., died December 4. He had been an employe of the company for 30 years.

Repair of the telephone lines in Missouri as a result of the storms has proved a large task. Employees of telephone companies have been reconstructing the lines torn down by the storm. It has been reported that 28 groups of men are working in or near Carrollton, Chillicothe and Marceline.

Approval of a first step toward the consolidation of the services of Keystone Telephone Co., of Philadelphia, with that of Bell Telephone Co. of Pennsylvania, has been sought in a petition filed by the latter company with the Pennsylvania Public Service Commission.

About $1,000 worth of repair work will be done in Hope, Kans., by the Farmers Mutual Switchboard association. A carload of telephone poles has been unloaded.

J. Howard Farmer, group manager for the Ohio Central Telephone Co. for 35 years, died Sunday at his home in Johnstown, Ohio.

The new trunk telephone line from Buffalo Prairie to Millersburg, Ia., has been completed which gives the telephone companies the first independent trunk line between the two villages.

The Central Iowa Telephone Co. is making extensive improvements on its lines in Conrad. New cables are being installed all over town.

V. E. Code of Topeka, Kans., has been named as division manager of the Kansas State Telephone Co. with headquarters in Baxter Springs. He succeeds L. E. Winget, who recently resigned. In addition to his duties as head of the Kansas State Telephone Co. he will be in charge of the Central Missouri Telephone Company with headquarters at Warrensburg, Mo., and the Peninsula Telephone Co. and the Arkansas Associated Telephone Co.

Actual construction work has been started on the new Ozark-Central telephone exchange building at Thayer, Mo.

The United Telephone Co. is constructing a new building at Plainville, Kans.

Directors of the Geneseo (Ill.) Cooperative Telephone Co., have voted to pay eight per cent dividend on the company's common stock Jan. 1. This amount has been paid for the past number of years.

Supreme Court Justice Staley granted the New York Telephone Co. a writ of certiorari against the New York Public Service Commission which recently imposed a new system of accounting on the company. The court will review the order of the commission. The telephone company contends they are following a uniform system specified by the Interstate Commerce Commission.

The Hutchinson, Kans., telephone rate case, pending for about a year before the Kansas Corporation commission, will be heard after January 1.

An investigation such as now is being made of electric power companies in Virginia will be made of telephone rates when the present studies are completed, says N. Lester Hooker, chairman of the Virginia corporation commission.

The Upstate Telephone Corporation of Johnstown, N. Y., which is taking the lead in opposing temporary emergency rate reductions imposed by the N. Y. Public Service Commission, has obtained a writ of certiorari from Supreme Court Justice Schenck.

The Indiana Bell Telephone Co. now is placing new aerial cable and eight miles of underground cable for long distance lines between Indianapolis and Anderson.

Walter L. Prehn, general manager of the Southwestern Bell Telephone Co., has been elected a director of the First National Bank in Dallas, Texas.

Basic Telephone Electrical Theory

(*Continued from page* 14)

mum value. This value was arrived at by measuring the relative heating effects of direct and alternating current. It was found that an alternating current source whose maximum value is 1.41 times that of a direct current source will produce equivalent heating effects. For example, a DC source of 707 amperes will produce the same heating effect as an AC source having a maximum current of 1000 amperes. This value of an AC wave is known as the effective value and is the value usually used in AC computations.

Fig. 6 illustrates the relation between average, effective, and maximum values of a sine wave. The reason that the heating effect is equivalent to 0.707 rather than 0.636 of the maximum value of an AC wave is the fact that heating effect is proportional to the square of the current ($P = I^2R$). Therefore, if we square all individual sine values of current in an AC wave and then divide by the number of separate values, we will get 0.707 rather than 0.636. This value of an AC wave is also known as the *root mean square value.*

Practically all AC measuring instruments with the possible exception of rectifier type instruments, and vacuum tube voltmeters, give deflections which are proportional to the effective value of an AC wave. Certain types of vacuum tube voltmeters give deflections which are proportional to the maximum value, and rectifier type meters give deflections which are proportional to the average value of an AC wave. The maximum value of a sine wave is often referred to as the "peak" value.

(To be continued)

A Proving Ground for Telephone Cords

(*Continued from page* 28)

of careful analysis of data, and occasional disappointments in the results of test procedures which make useless many days of effort. It is typical that an engineer persists stubbornly to struggle with such tedious detail and disappointments, knowing that in the end he will be satisfied only with an honestly superior product. Such is the spirit back of manufacturers' development to give operating companies the best possible equipment and they are justified in being proud of their achievements.

Association Explains FCC Questionnaire

(*Continued from page 30*)

the Independents engaged in interstate commerce.

Facts and the data obtained through the investigation and through public hearings may be used as a basis for a special report to congress and will be available for and will be considered in any future investigations of telephone rates made by the commission.

The Federal Communications Commission also issued this statement:

"The Commission will regard the following as substantial compliance with the showing required by paragraph (c) 7 of Commission Order No. 4 as amended by Commission Order No. 6: (1) if the applicant is an officer, director, trustee, receiver, attorney or agent of any business corporation he must make a complete disclosure of such position and state the general character of the business conducted by such corporation; and (2) if the applicant has a financial interest in any corporation furnishing equipment, supplies, research, services, finances, credit or personnel, directly or indirectly, to any communication company, he must make a complete showing of his interest and state the general character of the business conducted by such corporation, only in cases where five per cent or more of such corporation's annual gross business consists of furnishing equipment, supplies, research, services, finances, credit and/or personnel, directly or indirectly to communications companies. If the applicant holds a position named in (1) in a corporation described in (2), he must make the disclosures called for in both (1) and (2).

"Regularly licensed and practicing attorneys will not be required under number (1) above to show clients represented by them, unless such client corporations are engaged in conducting a communications service as a common carrier or come within the description in number (2) above."

A. T. & T. Against Being Part of Wire Merger

A sharp notice that it does not propose to abandon the telegraph field or merge with other telegraph systems was served upon the Federal Communications Commission by the A. T. & T. at the commission's hearings early this month.

C. S. Cooper, A. T. & T., vice president, said a merger of Western Union, Postal and R. C. A. would benefit the companies and the public, but made it plain his organization preferred to remain outside to compete with the unified system.

David Sarnoff, president of R. C. A., said:

"Telegraph companies have been woefully behind in research to develop their facilities. Marked strides can be made through mergers. I think if permissive legislation is passed, Western Union, Postal Telegraph and R. C. A. will get together."

J. C. Willever, Western Union vice president, appeared apathetic toward merger legislation, but said he would not oppose such congressional action if the commission favored it.

Postal Telegraph spokesmen told the commission a unified telegraph system would produce lower rates and greater efficiency.

Telegraph rates are in chaotic condition, due to the expense of meeting competition and to duplication of facilities, they testified.

Asked what companies he believed should be merged, Col. A. H. Griswold, executive vice president of the Postal, named Postal, Western Union, A. T. & T., R. C. A. and Mackay Radio.

Col Sosthenes Behn, president of International Telephone and Telegraph Co., parent company of Postal Telegraph Cable Co., advocating a unified system, said:

"I believe the telegraph industry cannot progress further under present conditions.

"The next important development will be the perfection and installation of person-to-person printer service. Once it is in use, a person will merely dial the number of the person with whom he wishes to communicate. Then he will print his message and it will appear instantly at the other end of the wire.

"I think it would be best, if mergers are to be effected, to separate land and cable telegraph facilities. They should be regarded as two distinct branches. I believe, too, that they should in no way involve telephone companies. These Two big communications agencies should continue in competition."

Col. Griswold stressed the fact that rates could be materially reduced and efficiency of service improved under a unified telegraph system. He said unification would permit extension of telegraph service to thousands of communities throughout the nation which are not now served.

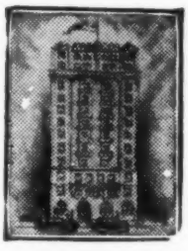
Predicts Normal Business By End of 1935

L. M. Berry & Co., telephone directory advertising company, is distributing colored charts showing the rise and fall of business, as well as commodity prices, during the past one hundred years, including a forecast for 1935 and 1936. The interpretations are based upon a chart of the National Association of Purchasing Agents, with acknowledgement to Col. L. P. Ayres of the Cleveland Trust Co., Cleveland, Ohio, and L. C. Reynolds of the American Writing Paper Co., Holyoke, Mass. The chart pictures business at normal by December, 1935, rising to twice the height of the peaks of the Coolidge prosperity era by the end of 1936. A copy of this chart can be secured without charge by writing L. M. Berry & Co., 215 W. Second St., Dayton, Ohio.

Buys Stock

Announcement has been made that Telephone Repair Shop and Rebuilt Electric Co., both of Chicago has purchased the entire stock of Electrical Instrument Co. of that city.

London has 37 per cent of all the telephones of Great Britian. New York City has nearly nine per cent of all the telephones in the United States.



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A Distinctive Hotel

It is easily accessible to shopping and theatrical centers, churches, libraries, parks and transportation lines.

Ladies traveling without escort will appreciate the atmosphere of security and rest it offers.

Every room with tub and shower.

ROOM WITH BATH $1.50

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Exide BATTERIES for every Telephone Service

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Specializing in Telephone Accounting
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Neon Lightning Arrester Units

Interchangeable with carbon mica or carbon porcelain.

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Rogers Park Station, Chicago, Ill.
We Specialize in Rebuilding Transmitters

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THE FARM SITUATION

Farm cash income is mounting steadily toward a probable $6,000,000,000 total in the 1934 calendar year compared with $5,051,000,000 in 1933. September income was the highest for any month since November, 1930, and it is quite probable that October income reached a still higher level.

In the first nine months of this year, income from sales, AAA benefit payments and emergency sales of cattle had reached $4,313,000,000. This is practically equal to income in the entire year of 1932. The last quarter is almost invariably the best quarter of the year.

Continued improvement in agriculture in 1935 is forecast by the United States Department of Agriculture in its annual outlook report. Greatly reduced supplies of most farm products with some improvement in domestic consumer demand are expected to bring about a higher level of farm income during the first half of 1935 than in the first half of 1934.—*The Agricultural Outlook.*

Frank Barnes Heads New S. C. Association

Frank Barnes, president, Rock Hill Telephone Co., was elected president of the newly formed South Carolina Independent Telephone Association at its organization meeting November 20.

L. E. Winget, general manager, South Carolina Continental Telephone Co., was elected vice-president and W. D. Wilkinson, auditor of the same company, was elected secretary-treasurer.

The board of directors include Mr. Barnes, Mr. Winget, A. G. Trenholm, Georgetown; J. W. Sproles, and C. B. Barksdale, Greenwood; S. L. Bell, Chester and O. W. Knight, Kershaw.

F. B. MacKinnon and A. L. Geiger, president and attorney, respectively, of the United States Independent Telephone Association, gave reviews of the national telephone situation at the meeting.

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CEDAR POLES
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Finished Cedar Poles
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LITTELFUSES
- INSTRUMENT LITTELFUSES, for meters, 1/200 amp. up.
- HI-VOLT. LITTELFUSES for transmitters, etc., 1,000 5,000, & 10,000 volt ranges, 1/16 amp. up.
- NEON VOLTAGE FUSES & Indicators (TATTELITES), 100, 250, 500, 1,000 & 2,000 volt ratings.
- AIRCRAFT FUSES, AUTO FUSES, RADIO FUSES, FUSE MOUNTINGS, etc. Get new Cat. 6.

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Special Printing for Telephone Companies

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Buy Them From A Telephone Supply House

We maintain our own printing department, equipped exclusively to serve the telephone industry.

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Send for Special Catalog No. 36 Listing these Supplies Exclusively.

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Equipment Co.
LAWRENCEVILLE, ILLINOIS

W. L. Runzel, President, brings to this organization 44 years' experience in the manufacture of this type of telephone equipment.

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May we quote you on your requirements?

RUNZEL CORD and WIRE CO.

4727-31 Montrose Ave., Chicago
The Home of the Perfect Cord

Send Your
Subscription Orders
Direct To
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185 No. Wabash Chicago, Ill.

Tilden Named President of N. C. Association

Robbins Tilden, vice-president, North State Telephone Co., High Point, was elected president of the North Carolina Independent Telephone Association at its third annual convention which was held November 22 and 23 at Sedgewick Inn, near Greensboro.

L. B. Bryan, manager, Durham Telephone Co., was elected vice-president and W. C. Darrow, Tarboro, was elected secretary-treasurer.

Among the speakers at the convention was retiring president, L. D. Densmore, J. R. Porter, A. L. Geiger, attorney of the United States Independent Telephone Association; F. B. MacKinnon, president of the National Association, and A. J. Maxwell, commissioner of the internal revenue of North Carolina.

The new board of directors include Mr. Densmore, Mr. Porter, Mr. Tilden, Mr. Bryan, Mr. Darrow, L. D. Coltraine, Concord; and B. L. Fisher, Martinsville, Va.

Bell Investigation Begins in February

Newspaper dispatches from Washington, D. C., on December 12 stated that the investigation of the American Telephone & Telegraph Co. and subsidiaries, which was scheduled to commence early in January by the Federal Communications Commission, will not begin until after February 1.

The commission, it is said, feels that it must have more funds through congressional appropriations before it can undertake making a proper and comprehensive survey. The costs of the survey are estimated at $75,000.

Preliminary work is being done in the field by a small force of employes of the FCC who are assembling data. As soon as sufficient funds are appropriated by the new Congress, the commission expects that it will be able to get the investigation into full swing.

Detroit's new post office and federal building contains more than 1,500,000 feet of telephone wire. This figure is the equivalent of nearly 300 miles.

New Items

(Carried regularly in stock)

Rosin core solder
40-60 wiping solder
Lead sleeving (cable)
Pole brackets
Hand Sets
Switchboard plugs
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A centralized accounting service at lowest rates.

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By a telephone man with 10 years' experience in manufacture, installation and maintenance of toll, manual, PBX step-by-step and panel dial systems in the Bell Company. Also 5 years' office and sales experience. Married. Age 35. Will go anywhere. Write D. R. D., c/o Telephone Engineer.

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With balanced coil. Locates shorts, crosses, grounds and wet spots; also tone circuit.

$49.00 Sent on trial.

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GALVANIZED PRODUCTS

Telephone Wire
▼▼
Steel Strand

Crapo Galvanizing neither cracks nor peels—not even when subjected to splicing, twisting or sharp bending. Its tight, ductile, ***pure zinc*** coating insures corrosion resisting joints, longer life, lower maintenance costs.

Crapo Galvanized Wire is made in EBB, BB and Steel grades. *Crapo* Galvanized Seven Wire Steel Strand furnished in Standard, Siemens-Martin, High Strength, Extra High Strength.

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If you keep posted, month to month, regarding developments in the engineering, commercial and managerial ends of the telephone industry through contents of this journal, you will have a fund of information that may save you hundreds, possibly thousands of dollars.

Each issue of this journal devotes itself to presenting data beneficial to you.

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WHATEVER we have accomplished during the past year has been made possible through the courtesy, cooperation and loyalty of our friends. Please accept our sincere thanks and our wishes for a Merry Christmas and a Happy New Year.

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A COMPLETE SUPPLY SERVICE For Every Phase of Telephone Activity

This organization is prepared to furnish telephonic supplies and materials of every description — and to deliver them in practically any country in the world. This service is manned by a thoroughly experienced staff of sales engineers, stationed in our various branch offices. These representatives will not only be pleased to advise with any telephone company or administration relative to local telephonic problems, but are also in a position to handle matters requiring detailed engineering analysis or research.

The quality of the equipment supplied by this organization is quite in keeping with the high character of its technical accomplishments. Only articles of proved merit are accepted for distribution, and every order purchased from us is guaranteed to give complete satisfaction in every respect.

We have just issued a comprehensive catalogue of supply and construction materials. If you have not already received a copy, send for one—TODAY. Ask for Catalogue 4000.

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Strowger Automatic Telephone Systems and P-A-X's — Monotype Manual Switchboards and P.B.X.'s — Automatic and Manual Telephones—Alton Storage Batteries—Phillips Wire and Cables—Construction Materials—Dry Batteries —Electrical Measuring Instruments—etc., etc.

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Sydney	Toronto	Santo Domingo	Milan	Montevideo	Bogota

and others.

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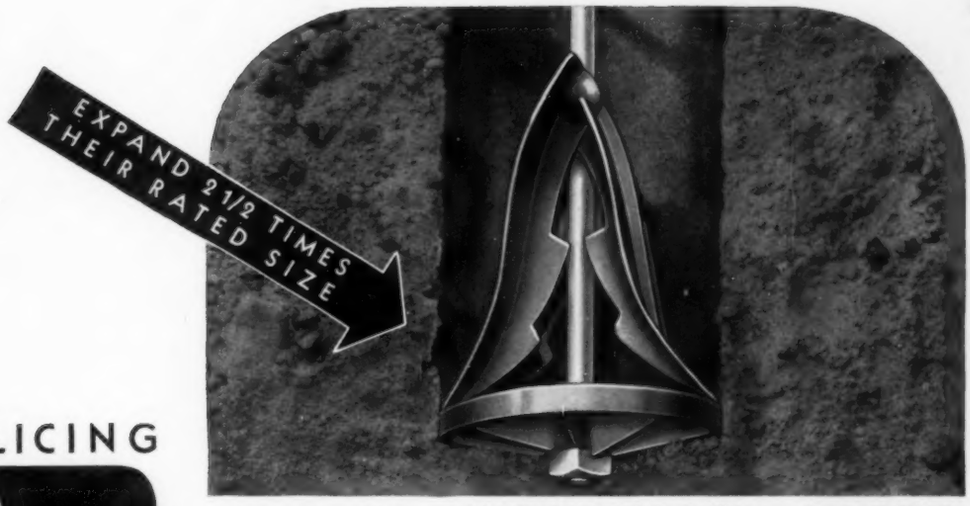

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Kearney A-B-C Sleeves make a form fitting, high pressure strain splice of high mechanical strength and excellent conductivity. Corrosive action is entirely eliminated by the cold welding principle of application which compresses the sleeve and wire into a compact, homogenous mass.

with KEARNEY HI-TENSION 4-IN-1 EXPANSION ANCHORS

THE greater holding power of Kearney Hi-Tension 4-in-1 Expansion Anchors is due to the large area in undisturbed earth. These Anchors expand 2½ times their rated size and have 63% of their area in solid earth. They are made of certified malleable iron to insure against breakage. A recessed socket for the nut permits the rod to be salvaged when desired.

The special 4-inch Screw Anchor at the right is an economical means of anchoring telephone bracket lines and single phase ridge pin lines.

In addition to Expansion Anchors, a complete line of Screw Anchors is manufactured to meet practically all anchoring needs.

Give your customers better service by using Kearney Anchors. Write for Bulletin 300.

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Kearney Solderless Con-Nec-Tites give the maximum pressure between the conductors for a given torque on the nut. This is possible because of the distribution of the pressure by the patented full-round washer which prevents gouging and spot loading. Meet your next connector requirements with Kearney Con-Nec-Tites.

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Stromberg-Carlson 1191 Handset . . . ringer, induction coil and condenser mounted in base of instrument, making it completely self-contained and doing away with desk set box.

Wise executive, the president of this operating company! He realizes that the telephone instruments located on the subscribers' premises represent less than 10% of his entire plant equipment, but that from those instruments comes the subscribers' opinion of the operating company.

That is why he is now offering subscribers the *new* Stromberg-Carlson 1191 Handset . . . a self-contained instrument with ringer, induction coil and condenser mounted in the base, yet no larger than the conventional handset. It completely does away with the desk set box.

From the operating company's standpoint, too, this is important as it costs less money for equipment, installation and maintenance, for there is but one piece instead of two.

Order a sample . . . test it under your most exacting requirements. You will then realize what a wonderful builder of good will this instrument is.

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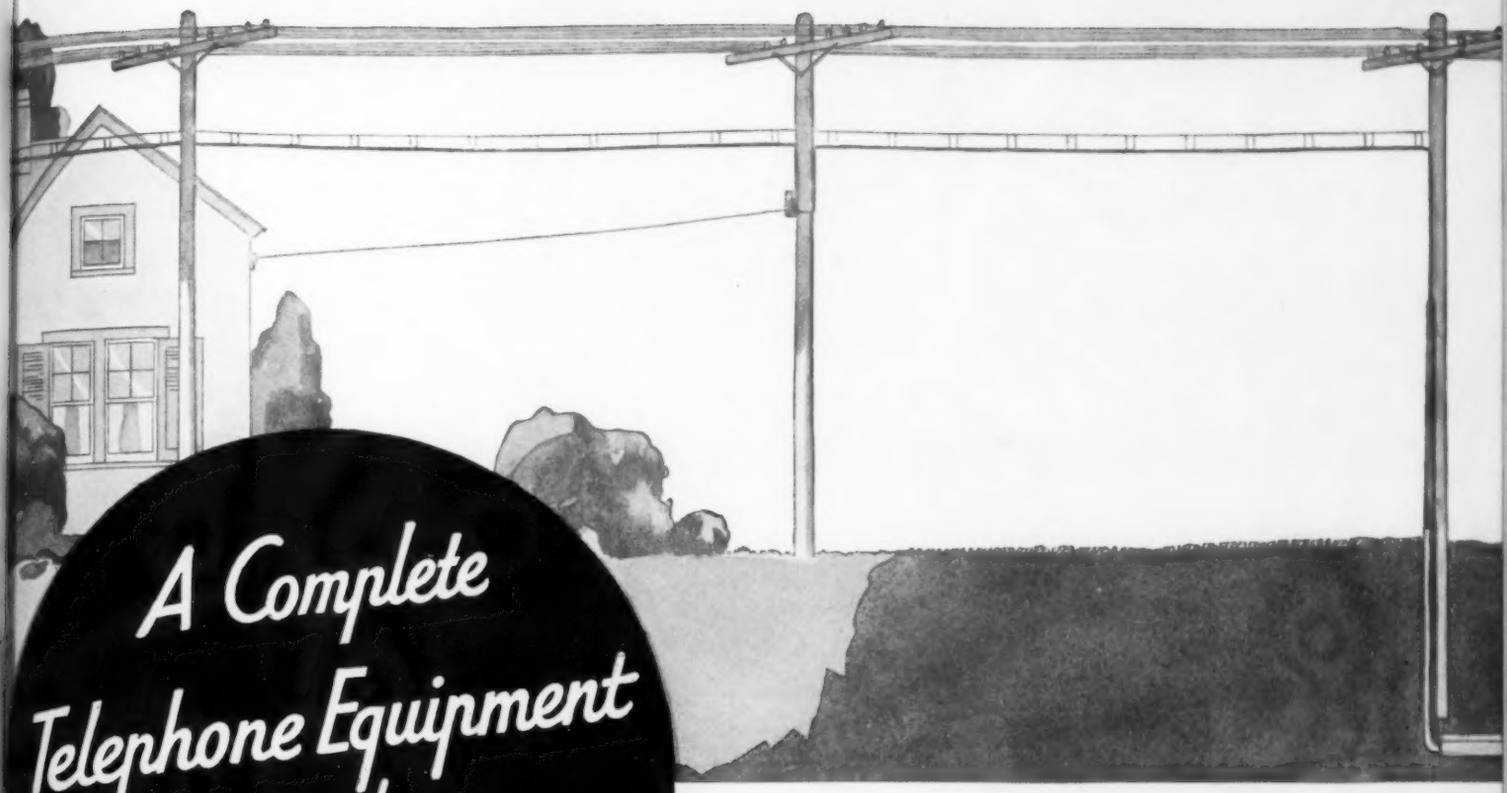

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Central Office Equipment—Central or local battery, manual, automatic or remote control, from 10 lines to a million—or more.

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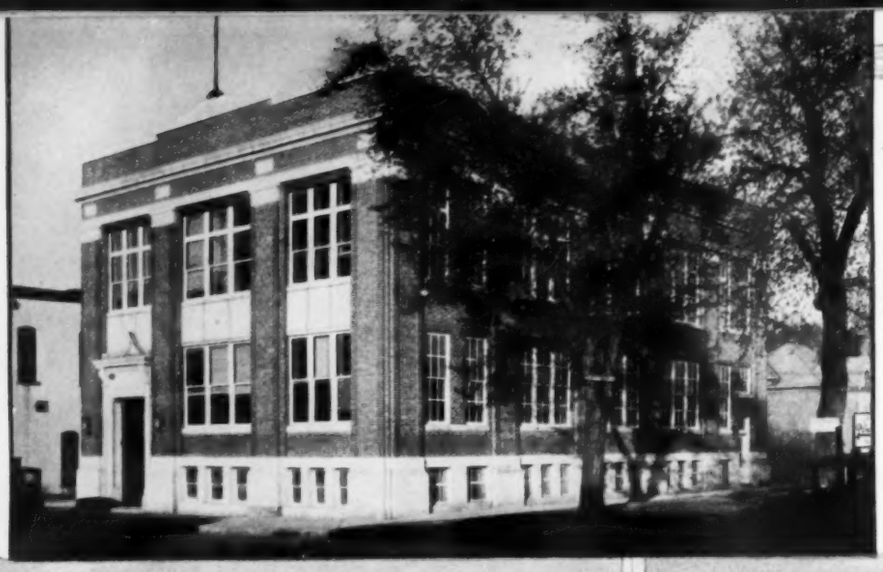

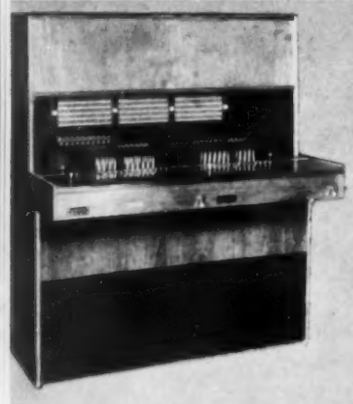

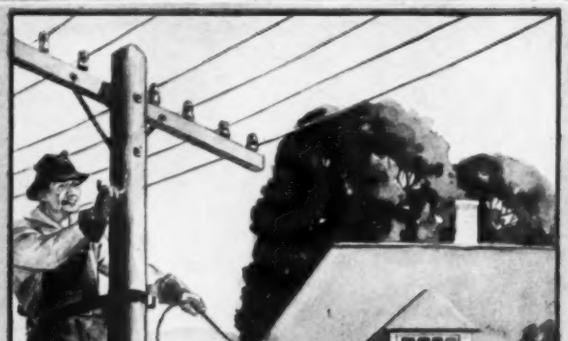

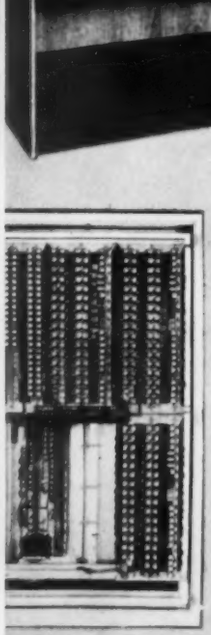

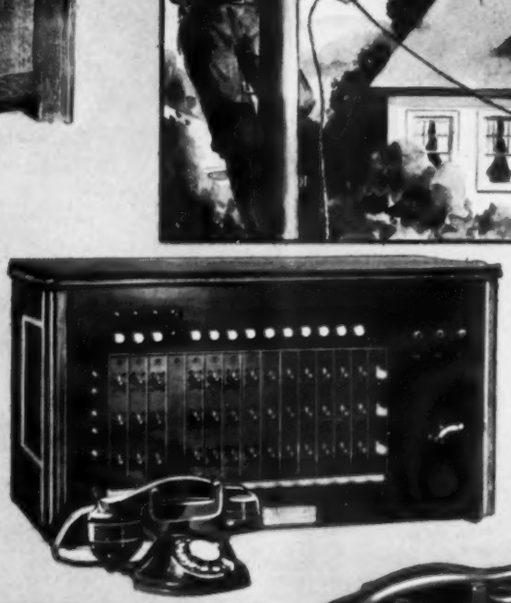

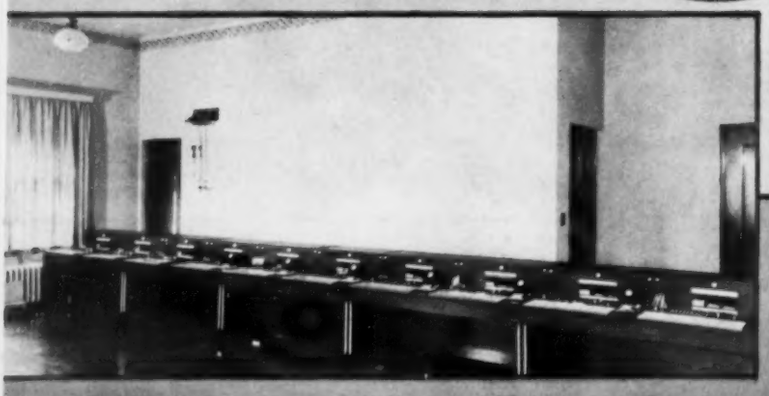

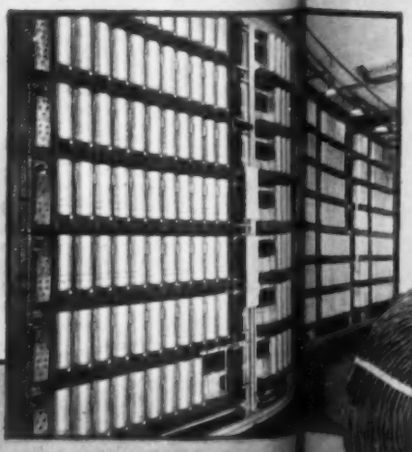

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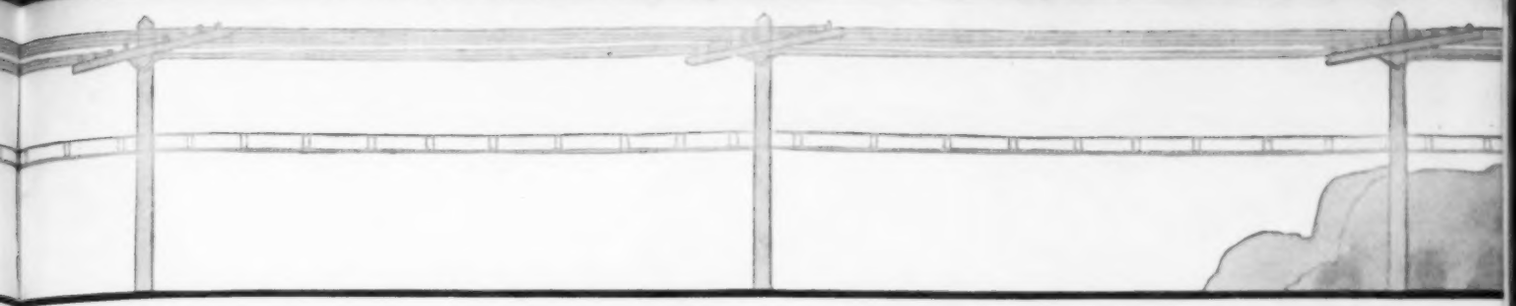

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1033 WEST VAN BUREN STREET, CHICAGO

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General Sales Agents in U. S. and Possessions for
AUTOMATIC ELECTRIC COMPANY, CHICAGO, and other companies

Exclusive Export Distributors
Automatic Electric Sales Company, Limited, 1027 West Van Buren Street, Chicago, U.S.A.
Automatic Electric Sales Company, S. A., 22 Rue de Verger, Antwerp, Belgium

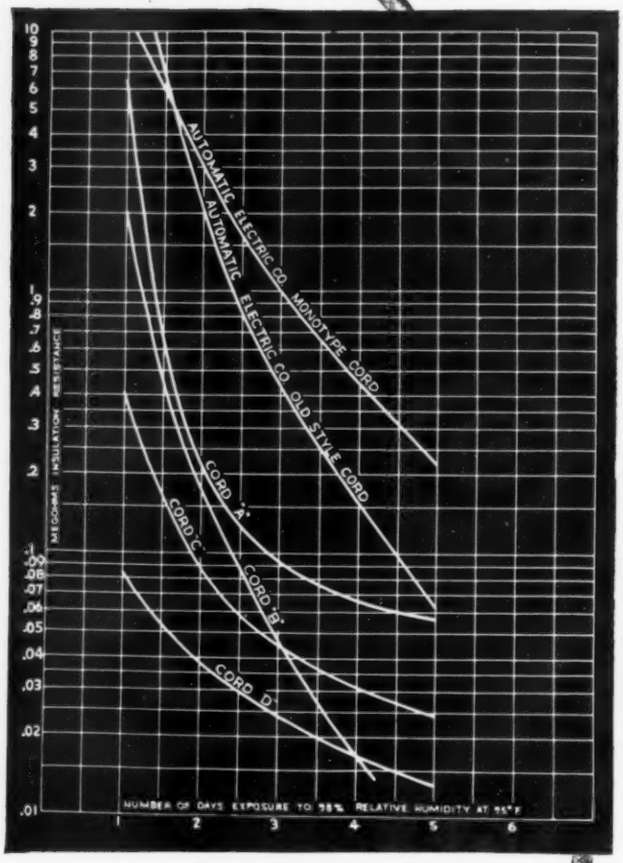
We Had The Monotype Cord Tested

and here are the results!

In previous advertisements we have described the new material used for Monotype braid and covering, as well as the special impregnating process now employed for these cords. We have stressed the greatly improved insulating qualities which result—and their importance to the user.

Now—in comparative tests—Monotype Cords demonstrate their superior insulation in exact, specific figures—from which are plotted the accompanying curves which speak volumes to the technical man. They show that even under the most adverse atmospheric conditions, Monotype Cords can "take it"—and still maintain a high degree of effective insulation.

Examine these comparative results closely. You will see why we are so enthusiastic about this new Monotype Cord, and why we say — Buy Monotype, and you'll never use another brand!


MEGOHMS INSULATION RESISTANCE
AUTOMATIC ELECTRIC CO. MONOTYPE CORD
AUTOMATIC ELECTRIC CO. OLD STYLE CORD
CORD "A"
CORD "B"
CORD "C"
CORD "D"
NUMBER OF DAYS EXPOSURE TO 98% RELATIVE HUMIDITY AT 95°F

The curves shown here graphically portray the superior insulation resistance of the Monotype Cord as compared with the previous Automatic Electric Company cord and four other commonly used brands, called "A," "B," "C" and "D." All cords were exposed simultaneously to exactly the same conditions of excessive humidity.

AMERICAN AUTOMATIC ELECTRIC SALES COMPANY

1033 WEST VAN BUREN STREET CHICAGO

"I don't want to cover up this new Hand Set . . . . it's designed by an artist . . . . "

"I remember when I first started housekeeping . . . the telephone was such an unsightly instrument I used to keep it covered with a cloth doll designed for the purpose. But since I have had a new Stromberg-Carlson 1191 Handset, I'm so proud of it I want everyone to see it." Householders in communities where operating companies are offering the 1191 Handset are talking this way. They are glad to pay the added charge for this Stromberg-Carlson Handset because it's completely self-contained . . . the ringer, induction coil and condenser are mounted in the base of the instrument. Walls are not defaced by a bell box. Its design is the work of a well-known American artist. Yet this new handset costs the operating company *less* for original equipment, installation and maintenance because there is but *one instrument* instead of two.

Stromberg-Carlson 1191 Handset . . . ringer, induction coil and condenser mounted in base of instrument, making it completely self-contained and doing away with desk set box

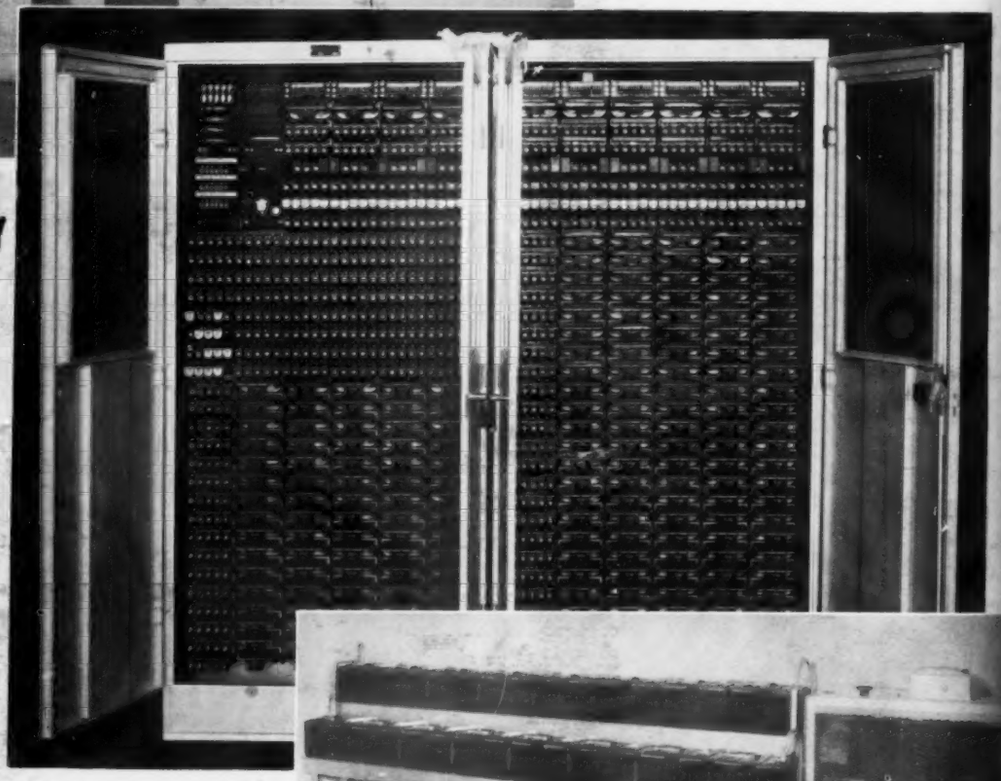
STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY
FACTORY AND GENERAL OFFICES: 100 CARLSON ROAD, ROCHESTER, N. Y., U. S. A. BRANCH OFFICES: CHICAGO, KANSAS CITY, SAN FRANCISCO, LOS ANGELES, SEATTLE, TORONTO, ATLANTA

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR MORE THAN FORTY YEARS

NORTH'S ALL-RELAY DIAL-AUTOMATIC EXCHANGE
CRESTLINE, OHIO

CAPACITY
1000 LINES
INSTALLED
5—100-LINE UNITS
EXPANSIBLE TO
9000 LINES
CUT-OVER NOV. 24
UNATTENDED



ALL-RELAY 100 LINE UNIT

NO MOVING PARTS EXCEPT RELAY ARMATURES AND SPRINGS

NORTH-WESTINGHOUSE
RECTOX
15-AMPERE
TAPERING
CHARGING UNIT
NO MOVING PARTS

NORTH ELECTRIC MANUFACTURING COMPANY
GALION, OHIO